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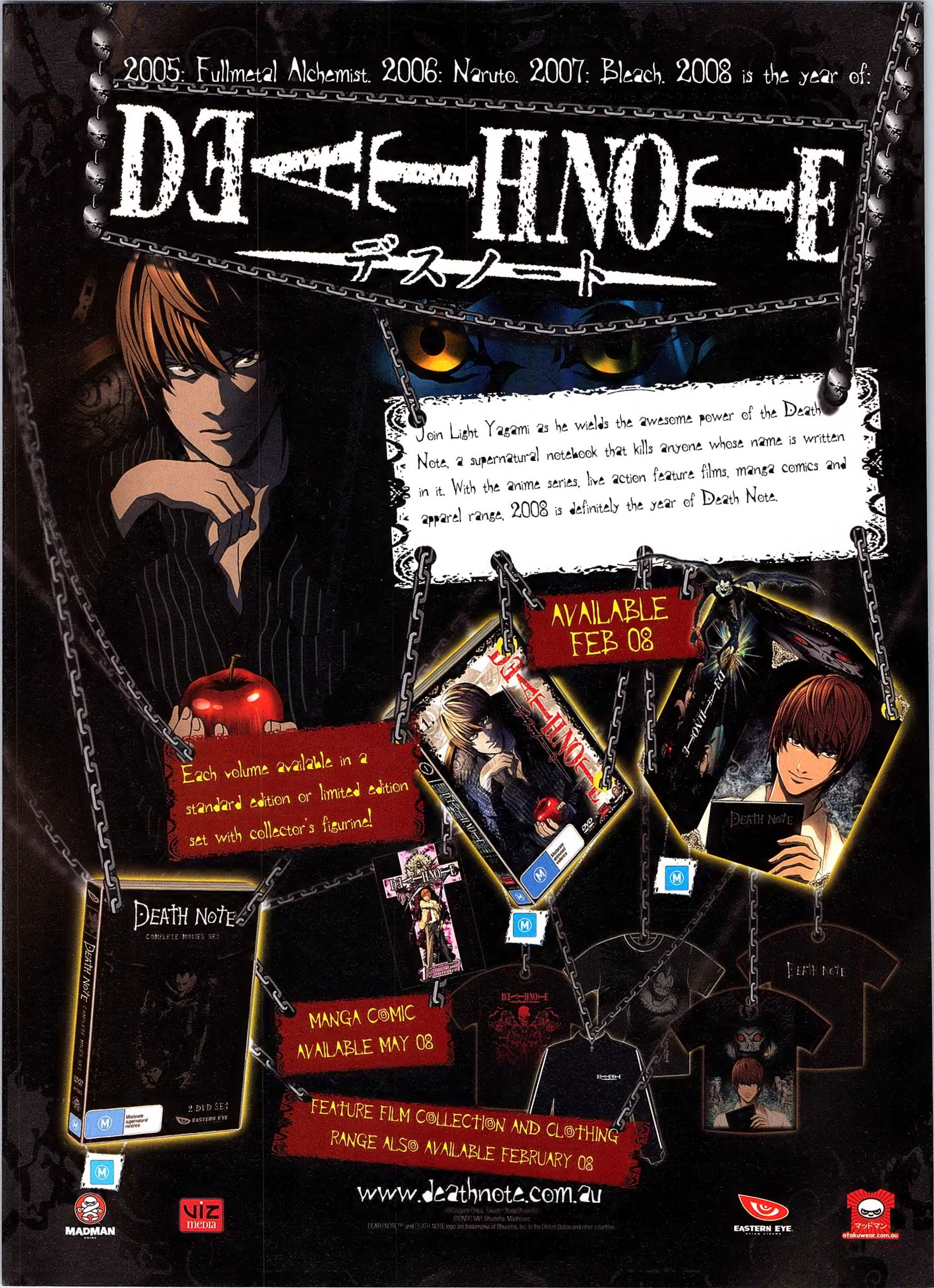
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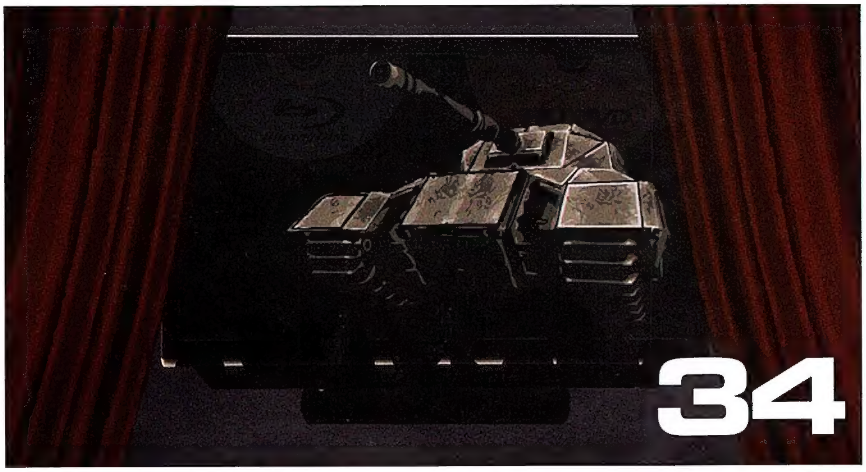

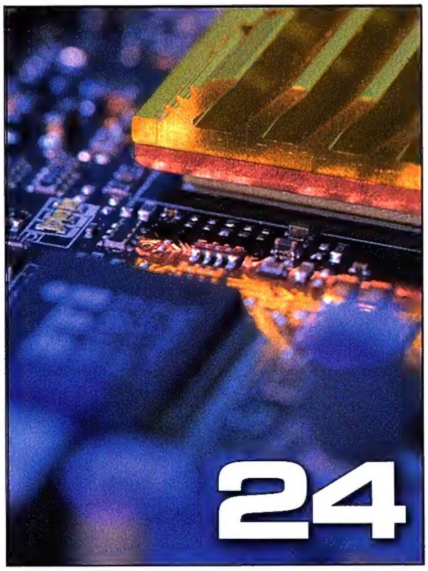

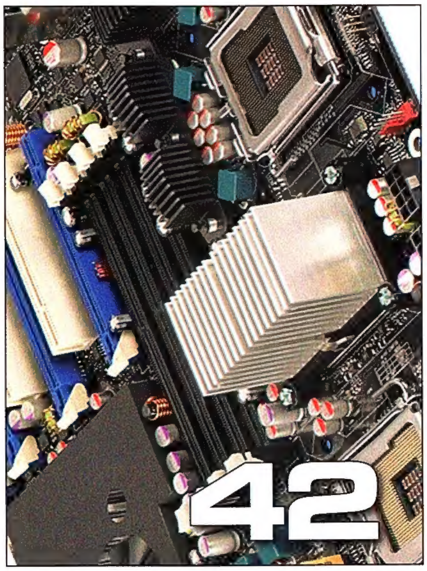

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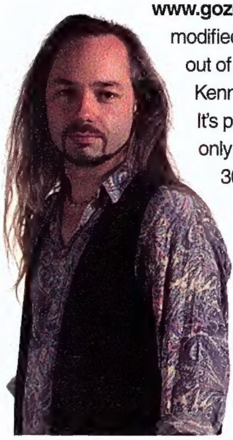
EDHEAD

A 2001 moment

At the beginning of the year I jetted off to the US to take in the enormity of the Consumer Electronics Show in Las Vegas. You'll find a write up of the event – or at least the bits that I got to see – in the news section, but up here, in my personal patch of the magazine, I want to talk about something else I did in Vegas.

Wait a minute… that sounds kinda wrong.

Anwyay, you might think that what happens in Vegas, stays in Vegas, but this was just too good to keep to myself. Intel had a huge presence at the show, unsurprisingly, and at its Extreme Gaming booth there was a competition with a helluva prize – a zero g flight. There were also reserved seats for some Intel bods and some very lucky journos. Guess who's a lucky journo?



Since 2004 these flights have been running commercially, through an outfit called the Zero Gravity Corporation (check 'em out at **www.gozerog.com**), using modified 727s operating out of Las Vegas and the Kennedy Space Center. It's pricey, as each flight only has capacity for 30 passengers plus crew, and avgas ain't cheap.

We flew out over the Pacific Ocean and performed a series of fifteen parabolas. As I said, each parabola gives you about 30 seconds of altered weight; the first parabola is at Martian gravity, about two thirds normal (I can just do one handed push ups in that gravity). The second and third parabolas are at Lunar gravity – one sixth normal, and those one handed push ups actually bounce you off the floor in a slow arc.

The final 12 parabolas are the real deal. A 2g burn up to the top of the arc, then 30 seconds of the strangest, most intense sensation I have ever encountered. You want to panic; it's just the most wrong thing you'll ever feel, as up and down slowly lose reference. I'm not afraid to admit I was bloody spooked the first couple of times, and because of the arc you're flying, it's very easy to end up plastered to the roof. Then the staff yell out "Feet down, coming out!", and you scramble to orient yourself as you're crushed back to the padded floor.

Astronauts make it look easy, but it really isn't. Afterwards I was tired and sore, from flexing every muscle in my body just to stay still, and just from experiencing fifteen parabolas – real astronauts go through about 40 or 50 on a typical flight.

It might sound a little shameless, but I really do have to thank Intel for the opportunity. It's something I'll remember for ever. When they say Extreme, they really mean it.

David Hollingworth
dhollingworth@atomicmpc.com.au

Hey Atomicans! On the 13th of March 2008 the Atomic LIVE Forum on The Future of PC Gaming is coming to Queensland University of Technology! We'll be announcing more details on our site soon. Sponsors include ASUS, Samsung and AMD. Keep an eye out!

Issue 83 winners: Leadtek prize pack: 1st: P Cunningham, Mt Druitt NSW; 2nd: Y Lee, Eight Mile Plains QLD; 2nd: T Pacey, Mitchelton QLD. Tabula Rasa: Major prize: M Rose, Waterford WA; Runners up: N Gilford, Glen Waverly VIC; R Dau, Gympie QLD; C McKibbin, Hewett SA; L Jones, Frankston VIC. Doctor Who & Torchwood: E Van der Walt, Albany Creek QLD; K Slater, Nhill VIC; S Freer, Moonta Bay SA; W McFarlane, Maryborough QLD; C Allan, Seabrook VIC.

Issue 84 Winners: Cyber Acoustics headphones: E Walker, Thornlie WA; D Latham, Gladesville NSW; M Walker, Bilambil Hts NSW; K Miller, Banyo QLD. Unreal Tournament III: Major prize: J O'Keefe, Prospect TAS; Runners up: D Smith, South Oakleigh VIC; K Hards, Ballarat VIC. ESET Smart Security: L Fisher, Goomalling WA; K Miller, Banyo QLD; J Miller, Scarborough QLD; J McGraw, Burnett Heads QLD; B Gabel, Ingle Farm SA; S McKenzie, Durack NT; S Noske, Ferntree Gully VIC; S Hennessy, Skipton IC; W Lovett, Birmingham Gardens NSW; L Middleton, Donvale VIC; R Haku, North Bondi NSW.

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CES 2008 – Vegas, baby!

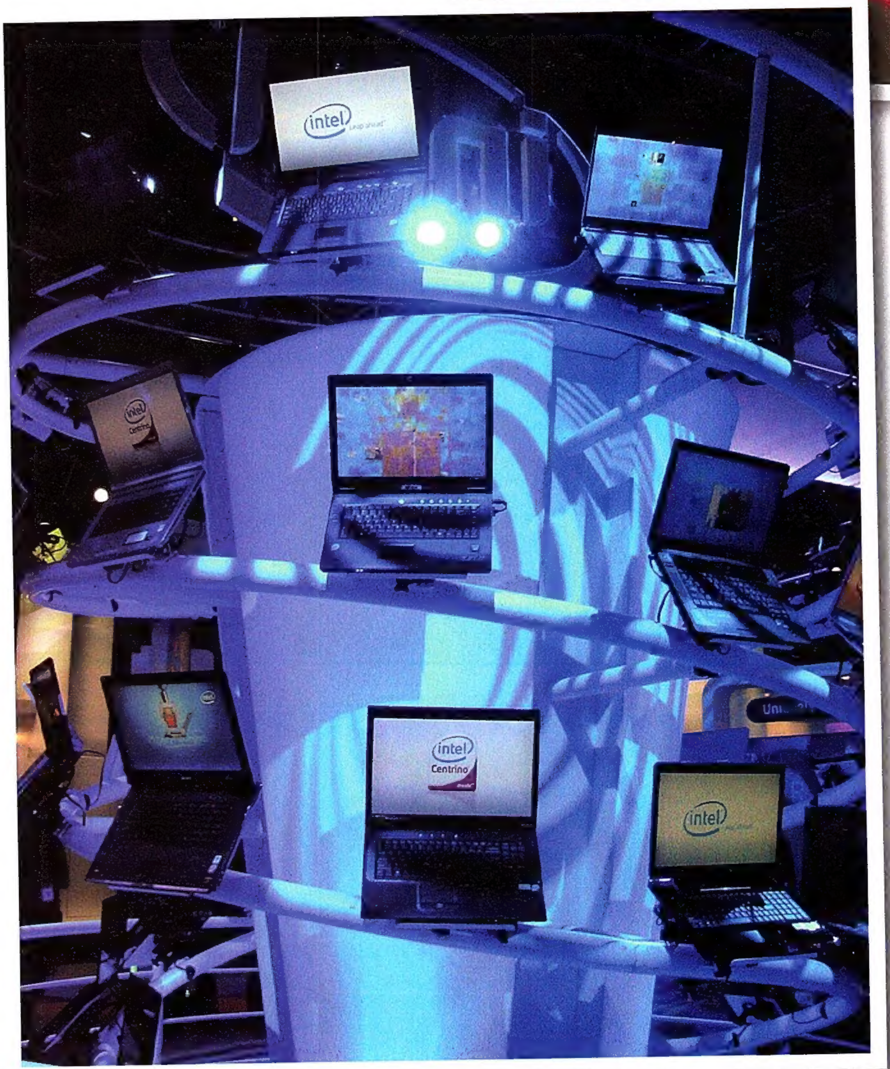
David Hollingworth reports on the excess and glamour of The Strip. And there was a show on, too...

I just want to get something off my chest straight away. At CES… I failed. I failed my Saving Throw against Awe at the sheer damn size of the thing. I failed my Spot check to actually see the entire show.

I also failed on the coke and hooker front, but I was too busy for the most part to properly enjoy the subtle pleasures of Las Vegas anyway.

So yeah: CES = huger than anything you've seen. To give you a sense of scale, if you attended Atomic LIVE last year you may be intrigued to know that the area that the Microsoft and Intel stands took up was roughly equivalent to the entire hall we had for LIVE.

In that space MS was pushing its new Windows Home Server quite heavily, along with Games For Windows and MSN aided mobile connectivity. Intel, similarly, was pushing mobile connectivity via its WiMax wireless standard, and so its stand was full of notebooks, ultraslim handhelds and mini-PCs, all running Menlow and Penryn mobile and desktop platforms.



The Menlow family is made up of the Silverthorne processor and Poulsbo chipset. It's an extremely low power solution, being both five times smaller and ten times less power hungry then previous mobile processors.

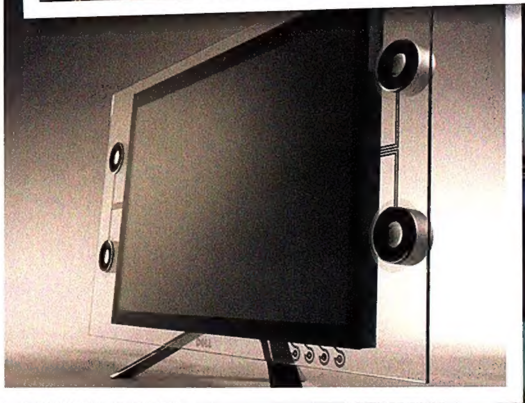
The Santa Rosa refresh of the Penryn was launched at the show, based on the now officially announced 45nm die process. The new update boasts Deep Power Down Technology and new SSE4 instructions. The former allows the chip to power down sections of itself that are not being used, while the latter offers a boost to HD playback and image manipulation.

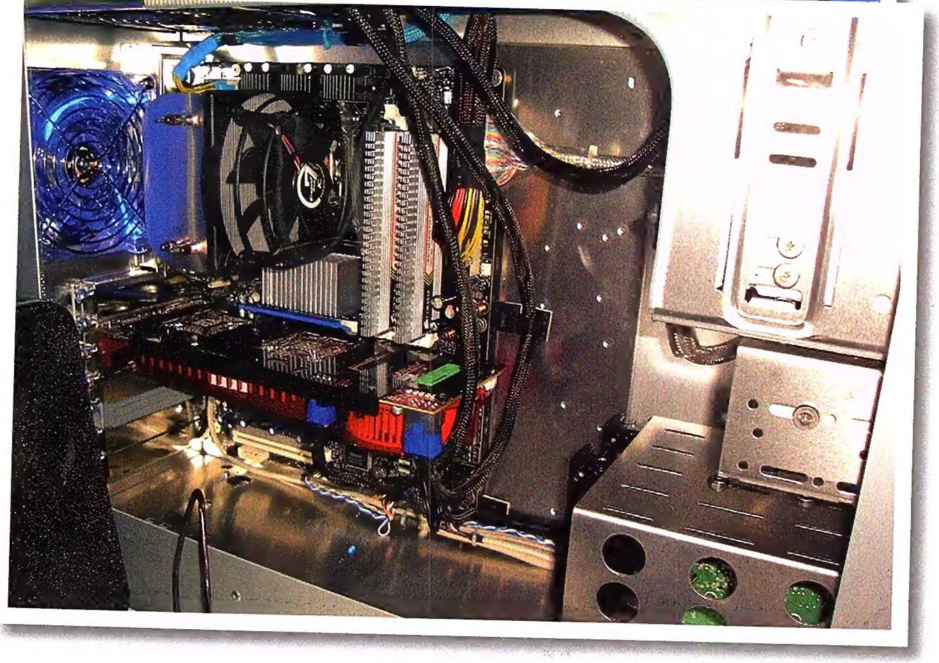
There are three quad core processors and four dual core processors in the Penryn desktop family. All are based on the 45nm process, feature SSE4 and good sized L2 caches. The dual cores should be available now, and the quad cores are an expected first quarter release (so also may be available by the time you read this).

Of course, the big news for enthusiasts is Skulltrail, which we actually managed to see in action. This ultra high end, most drool-worthy platform is built around the new QX9775 processor (with a 1600MHz FSB and running at 3.2GHz), running on Intel's 5400 chipset (which supports DDR3 natively). It's a dual quad core setup with four PCI Express 1.1 x16 slots. Did we

Top: The Innovation floor at The Sands. Dean Martin impersonator not in shot. Not top: Intel trying to make a point about how mobile it is.

Bottom: Bonetrail, looking crazy-insane. **Above bottom:** Kill. Your. TELEVISION. **Next to that:** Dell's shiny new Crystal display. We DOLed (drooled out loud). **Above that one:** Chairs! A new invention from CES! **Next to that:** The single best thing you might ever own – an R2-D2 video projector with iPod dock and more.





say enthusiast level kit?

In action it's stunning. It blows away *Unreal Tournament 3*, easily managing the game at max resolution, with all settings set to 'eye-bleeding-detail'. *Cinebench* barely gets a chance to break a sweat, and it can even manage real time weather and traffic in the notoriously hungry *MS Flight Simulator X*. The machine we got to see in action had also been tweaked up to a shade over 4GHz, was super stable, and we'd kill any one of you to get one. Sorry.

Of course, as big as the Intel and MS stands were, it was only a small part of the overall show.

LG, Philips, Sony and Samsung all had an enormous televisual presence. Screens of up to 108in were par for the course, with Japanese manufacturer Matsushita even releasing a sumo-sized 150in plasma TV. That's a screen the size of nine 50in plasmas, and with a resolution four times better than full 1080p. Truly, a television that even God would be jealous of.

Speaking of screens, that was Dell's big draw at its stand. The 22in Crystal display looks pretty much just like it sounds – a lovely screen embedded in a clear perspex backing. It's very Apple-like in its

Here: Just a small portion of one hall... There: Robots were big at CES. Down there: Another packed Skulltrail system. Over there: Controlling your TV through dance!

design, but this is no bad thing. It's a great display for public areas like loungerooms, has built in speakers, boasts a 1680 x 1050 resolution at 60Hz and a 2MS response time. Even better than the capacitive controls is the fact that only one cable snakes out of the back of it, carrying HDMI, DVI, subwoofer out, USB, and power.

True size queens would leave the Crystal in a cloud of dust for Dell's 3008WFP, however. This 30in giant can push pixels at 2560 x 1600 resolution and with a 3000 to 1 contrast ration. It's only got a response time of 8ms, though, but still... so... much... screen! It also comes standard with four USB ports and a nine in two card reader.

Networking hardware is about to get a lot sexier, thanks to Lunksys' latest range of gear. Gamers will particularly be impressed by the WGA600N Dual-Band Wireless-N Gaming Adapter, along with a whole family of sleek and wonderfully feature Wireless N adapters and routers. We'll cover these more in coming issues.

And there was more... and more... and so much more. I've already written up some of the other highlights of the show online (**www.atomicmpc.com.au**, if you need to know), and it's all still a little overwhelming. For now, however, I'll leave you with a selection of photos from the show itself.

> “The Skulltrail machine we saw was tweaked to just over 4GHz, and we'd kill any one of you to get one. Sorry.”

Left: A selection of sexy drive enclosures. Shiny. Not Left: The OLED-blinged Optimus keyboard, which looks even better in person, and is fully customisable. WarCrack, here it comes!

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TECHTRENDS

Quenching your thirst for the latest technology and hardware happenings

Windows 7 closer than you think

What? But **David Hollingworth** hasn't finished hating Vista yet?!

So it looks like we might be getting a new Windows OS as early as 2009. Next year, in other words, and to say this is causing some discussion and consternation is to state the matter rather lightly indeed. Some find it troubling that serious development – builds are shipping to testers early this year – is already happening on the new OS when the old one is still not nearly as widely accepted or good as it should be. Others are more concerned that it heralds a vastly sped up cycle of releases that essentially amounts to paying hard cash for what may well be Service Pack.

But what do we know about this new version of world's most popular OS? The Milestone 1 release (M1) that is doing the rounds, and that various reviews of can be found online, suggests that the UI remains more or less unchanged, but some things do stand out. Gadgets are now integrated into Windows Explorer, and can be accessed easily with a right-click; there's a new version of Windows Media Center and a Gadget to go with it that displays whatever is playing on WMC. There's also new version of Calculator, WordPad and Paint to look forward to. Woot.

Microsoft seems to be leaning toward more touch interface features in the OS. Whether this is all part of the Microsoft's Surface technology – which we saw at CES, incidentally, and it really is super-cool when you see it in person – remains to be seen, but Hilton Locke, a Software Test Engineer with Microsoft's Tablet PC group said in a blog that "if you are impressed by the 'touch features' in the iPhone, you'll be blown away by what's coming in Windows 7."

The M1 build comes in 32- and 64-bit flavours, and Microsoft has already stated that Windows 7 will be the last 32-bit OS the company delivers. M2 of the OS should go to testers around mid-year, with a third version shipping out in the last quarter.

Though internal testers only refer to this m1 version Windows 7, many are still referring to it as Vienna.

Data ahoy!

Now that's one heck of a cooling solution!

Man, and you thought Big Willy was the biggest storage solution around! A Silicon Valley start up recently announced its plans to commission a floating data center as an answer to keeping vital information independent from land-based disaster scenarios. You know, like Cloverfield.

International Data Security plans to use decommissioned and mothballed ship, with up to 200,000 square feet of space (that's a lot of terabytes…). On board will be the usual vast SAN and NAS set ups, a held desk, disaster recovery and other professional grade services. Each ship will also boast Overnight Accommodations, a galley for food services and Meeting rooms. The first ship, the SS Pacific Star, will be online in months and will also serve as the company's headquarters.

What's even more fascinating than the concept of a floating data center, is the green thinking behind the idea – the ships are recycled, saving on scrapping and other environmental concerns, and heat management will be balanced by using sea water as coolant, saving up to 40 per cent on energy usage.

POST OF THE MONTH

Killer deadlines, Christmas holidays and drinking ourselves stupid got in the way of the last Post of the Month, but now it's back – with a vengeance! We were recently humbled – but not at all surprised – by the care and generosity of the Atomic community when a forum member put out a call for donations of games and hardware to give to a children's ward at Westmead Hospital in Sydney. PS2, XBox & PC games were offered up as well as a PS2 and an Xbox, and many more DVDs and other hardware. It was, and excuse me for getting teary, proud moment to be amongst such great people.

But the real man of the moment is he who organised and channelled the whole thing. So without further ado, I am happy… Nay! Damn proud to award POTM to Josho! Everyone wave your arms about in a Kermit-like manner to celebrate his win-ness!

And here's the thread:

http://www.atomicmpc.com.au/forums.asp?s=1&c=1&t=117163&p=0

But, as always, there were many other great, wonderful, informative and downright cool posts on offer…

mm80x, I see your face when I am dreaming.
That's why I always wake up screaming. It makes more sense if you check out:
http://www.atomicmpc.com.au/forums.asp?s=1&c=1&t=117155&p=0

dave_blob went above and beyond to with some Ruby on Rails support:
http://www.atomicmpc.com.au/forums.asp?s=2&c=10&t=4480

Mac Dude's history of the beard made the hair on the back of my neck stand up. And walk onto my face. Check his post in this thread:
http://www.atomicmpc.com.au/forums.asp?s=1&c=1&t=118632

segger gets down and dirty with Cisco in this excellent thread:
http://www.atomicmpc.com.au/forums.asp?s=2&c=17&t=5486

Big ups to both mark84, merlin13 and everyone else who helped out in this networking epic:
http://www.atomicmpc.com.au/forums.asp?s=2&c=17&t=5495

And, finally, MrFriendly gets a hand for this missive of religion and faith:
http://www.atomicmpc.com.au/forums.asp?s=1&c=1&t=119567

Every **Post of the Month** *wins a fabulous* **Logitech** *mouse from the brilliant people from* **Logitech**… *Huzzah!!!!*

Perfect Combo of Performance and Energy Conservation

If you're the kind of person who is environmentally conscious and still want a powerful motherboard, then its time to pick up the new ASUS P5N-T Deluxe motherboard. This feisty motherboard is equipped with NVIDIA's nForce 780i SLI chipset with ESA (Enthusiast System Architecture) support, and features the revolutionary 3-Way SLI technology that gifts users with extreme graphics performance from three (yes three!) graphics cards! What's more, the ASUS EPU (Energy Processing Unit) digitally monitors and fine-tunes the CPU power supply under any loading in real-time to achieve the best possible power efficiency - up to 58.6% CPU power savings in fact, when your PC is running low intensity applications.

Advertisement

Mind games

James Matson adjusts his pants in preparation for games controlled by pure thought.

Electroencephalography; just spend a few minutes sounding the word out. There's nothing even remotely sexy about it, is there? It's a monstrosity of a term born from the world of science, a breeding ground for roll-off-the-tongue words like Hexakosioihexekontahexaphobia. But Electroencephalography (or EEG) is actually remarkable, because it's what scientists call the art of measuring electrical activity produced by the human brain. Okay, so while EEG isn't so hot by itself, using it to control characters in your favourite FPS or RPG game is, and while this technological carrot has been dangled in front of consumers for years now, the first retail products could be just around the corner.

If events like the 2007 Game Developers Conference (GDC) in San Francisco are anything to go by you can throw away your Logitech G5 and bury your keyboard. The GDC was host to several firms – Emotiv Systems among them – that are invested in the development of visors and headwear that will use EEG to allow players to directly control the on screen action, measuring brain activity and translating it into game input.

Emotiv showcased a modified *Harry Potter* game where the player thinks about moving blocks to solve a puzzle, and sure enough the on-screen objects react accordingly. Taking input devices in new directions is perhaps the last great frontier of gaming. We're pushing the graphics, the AI and the immersion factor. All that's left is to revolutionise the way a player controls their in-game environment, and the final triumph could well be consumer EEG tech that's evolved from systems used today in hospitals to measure patient brain activity.

Although Emotiv isn't releasing too much in the way of substantive tech specs, rumours abound that we'll be seeing the first widely available game controllers sometime this year. Pricing information is equally sparse, but we're guessing the initial products won't be cheap. EEG devices for home use, stress reduction headsets that measure brain, heart and muscle signals as well as GSR (skin resistance) can cost anywhere from a few hundred to well into the thousands.

The applications of thought-driven gaming aren't just limited to allowing gamers to move characters or perform physical actions with their minds, emotional states can also be monitored. Imagine playing the next Thief game, and having your ability to sneak effectively from place to place dependent not only on the movements of your character in the shadows, but on how calm you're able to keep yourself emotionally? Games like *Doom 3* – played in the right atmosphere – can actually invoke real anxiety and fear in the player, but it's an emotional state that's largely detached from the game play, EEG monitoring of 'alpha', 'theta' and 'beta' brainwaves could connect these feelings directly into the digital world, reducing the effectiveness of your character because you're having conniptions in your arm chair.

So in amongst all the excitement and Jediesque movement of household objects with thought alone, is there a downside? Potentially, yes. Domenic Greco, founder of Smartbrain Games and a clinical psychologist is concerned that use of EEG game controllers could result in unexpected brain states for the consumer. "When you start messing with the brain, that raises concerns" says Greco, citing the potential for players to get into a relatively relaxed brain state, heavy on the 'Alpha' waves (the same brain waves we produce just prior to sleep) and then go hop into our car and try to drive with potentially disastrous consequences. And here we were thinking the only real concern would be emo kids uncontrollably committing suicide before passing the first level.

> "... rumours abound that we'll be seeing the first widely available controller this year."

SHORT CIRCUITS

Shaken not stirred? How about not at all!

Due to a financial disagreement between Microsoft and Nintendo, it looks as though players will miss out on the Xbox live arcade release of one of the most stellar multiplayer shooters ever released on a console, *Goldeneye 007* for the N64. The Bond themed title was in development by Rare and would have featured the same maps, graphics and weapons as the original, but now we're just hoping the companies can resolve the dispute and give us gamers our retro gaming goodness.

Thank goodness McDonalds is out there on the frontline, pinpointing the root cause of child obesity. In a recent statement to The Times, McDonalds UK chief executive Steve Easterbrook cited video games as the reason kids these days are hovering on the chubby side of the fence. Of course! How could we have been so blind? As if it could have anything at all to do with the densely packed fat-burgers churned out by the fast food giant every day of the week. Enjoy your cheeseburgers kids, just make sure you don't play too much *Crysis*.

Soul Yoda

Star Wars beat-em-up?

Soul Calibur is one of those undeniably awesome fighting game franchises, the kind that keeps even ardent PC users buying a console just to open up crazy sword-wielding moves on a bunch of bad guys. So what would make it even more awesome? If the trailer of *Soul Calibur IV* is anything to go by, Yoda and Darth Vader, that's what. The teaser trailer for the fourth installment of the beat-em-up legacy features both these Star Wars staples – complete with light sabers – dealing death alongside familiar characters like Voldo and Nightmare. Is this a good thing? No, probably not. It just doesn't make sense. The two worlds have absolutely nothing to tie them together, so the reason to include Star Wars characters is dubious and smells of cheap, possibly insane movie tie-in tactics by Namco. Keep your eyes out for *Soul Calibur V*, featuring Ren, Stimpy and David Letterman.

Celebrating Sid

GDC recognises the impact of Sid Meier

It's not all that common to know the name of an individual game developer, the team sure – but not a single person. You'd be hard pressed to have ever hovered around strategy or sim games and not heard of Sid Meier however. The man is practically the father of turn-based strategy, churning out titles like *Railroad Tycoon*, *Civilisation*, and *Pirates!* He's got a fair swag of other awards to his name, but at this years Game Developers Conference (GDC) Sid will be honored with the Lifetime Achievement Award for his incredible impact on the games industry. We're absolutely comfy in saying that for the man that gave the world the greatest turn-based strategy title of all time, there just aren't enough awards, ever.

Is the constant hunt for game patches and content updates too much for you to handle? If so, you might be interested in CrosuS, under development by Isotx. Once installed the CrosuS application will scan your PC for installed games, and using connectivity to the internet, present you with a list of pertinent patches, updates and mods for the titles you're currently playing. That's reasonably neat and lazy, we like it.

Microsoft makes reasonably solid peripherals for the PC, but Logitech have the gaming mouse and keyboard market completely cornered with gems like the G5. Microsoft obviously realise this, and speculation is starting to circulate that the software giant is looking to buy Logitech lock, stock and barrel to position itself as a gaming peripheral giant. Daniel Borel (co-founder and board member at Logitech) said the reported buyout is 'rumour' but that he can't make any specific comment one way or the other. Ominous.

PIPELINE

Rise of the Argonauts

TBA

Argonauts – not to be confused with Cosmonauts (because that always happens) – are those loveable hardcore Greek heroes who like to fight, and win. Codemasters' *Rise of the Argonauts* is shaping up to be a visually detailed RPG so heavily dripped in Greek mythology it makes *God of War* look meager. The game revolves around the plight of Jason and his Argonaut posse, searching for the famed Golden Fleece. Early trailers indicate unique island levels – each one themed after a Greek God – and frequent appearances from creatures of myth and legend. Powered (unsurprisingly) by the *Unreal 3* engine, *Rise of the Argonauts* also promises Co-Op mode for 2 players, meaning Chimaera bashing will be the team affair it was always meant to be.

[Platform] PC, Xbox 360, PS3
[Developer] Liquid Entertainment
[Publisher] Codemasters
[Web] www.codemasters.com/argonauts

Tiberium

Q3 2008

Command & Conquer, while an action packed RTS game, never translated well into the first-person shooter environment. Remember *Command & Conquer: Renegade*? What an abortion. EA has decided to right the wrongs of the past however, and try again with '*Tiberium*', another FPS based in the *C&C* universe. The player will take on the role of a GDI captain 11 years after the end of the third Tiberium war, and the reason it all looks promising is that the game play is described as a squad based *Ghost Recon Advanced Warfighter* in the C&C setting. The mixture has definite merit on paper, and could make for a corker sci-fi tactical shooter if it all comes together. Keep an eye on this one.

[Platform] PC, Xbox 360, PS3
[Developer] Electronic Arts
[Publisher] Electronic Arts
[Web] www.ea.com/tiberium

ATOMICCHAT Talking to the finest human beings on earth...

Chas Boyd, DIRECTX SOFTWARE ARCHITECT

Alexander Gambotto-Burke gets some one-on-one time with the one of the driving lights of DirectX 10

atomic Could you explain the new features available in DX10?

Chas Boyd: New features in DirectX 10 maximise the power of the GPU, allowing games to more efficiently use powerful modern video cards to their fullest potential, while freeing up the CPU for improved artificial intelligence in games and bigger game worlds. The programmability and power of DirectX 10 allows developers to create more complex environments and detailed characters, as well as more powerful physics and artificial intelligence. We also re-architected the Windows Display Driver Model to provide more stability and better performance.

atomic What are the major differences with DX10 and DX9?

Boyd: We took a dramatic new approach with DirectX 10 in Windows Vista, rebuilding it from the ground up in order to provide a rich, incredibly detailed experience, while delivering many times the graphics performance potential.

atomic What's new in Shader Model 4.0?

Boyd: Support for longer unified shaders creates more flexibility for developers and allows programmers to use the GPU for features such as physics calculations and audio processing. Shader Model 4.0 includes a stringent specification designed to simplify development, with features such as 32-bit colour depth precision. The features in Shader Model 4.0 also make DirectX 10 more effective for audiences such as CAD/CAM designers or creators of movie special effects.

atomic At this point, what do you see as being the best showcase of DX10 technology?

Boyd: Our partner publishers have done some amazing things with DirectX 10 technology. The award-winning Crysis has been almost universally declared the most visually advanced game available, due in no small part to Crytek's use of DirectX 10. Other titles, including Gears of War for Windows, BioShock, World in Conflict and Flight Simulator demonstrate what DirectX 10 can offer to games in a variety of genres.

The majority of games out today (even console games) are built with DirectX 9, which has had more than five years to mature. DirectX 10 games look great now, but in five years developers are going to stun people with the graphic fidelity. We opened up the API for developers to do more with it, and as for hardware vendors, they have all agreed to support all of the features DirectX 10 has to offer. With the new generation of GPUs gamers will no longer have to worry about whether their cards will support certain features or not.

atomic Why can DX10 never run on XP/2000?

Boyd: DirectX 10 requires specific features of the Windows Vista operating system in order to take full advantage of graphics hardware, specifically the functionality offered by the new display driver model, WDDM.

atomic Was the public backlash about DX10 being Vista-exclusive expected? How do you feel about it?

Boyd: The adoption period associated with any new technology can cause some users to feel left behind. We've done our best to limit complexity for users by assuring that all DirectX 10 titles are backwards compatible with DirectX 9 hardware and Windows XP. As Windows Vista rapidly becomes the platform of choice for PC gamers, we feel confident that Windows gamers will appreciate the quality and features Windows Vista brings to gaming, and to DirectX 10.

SONY

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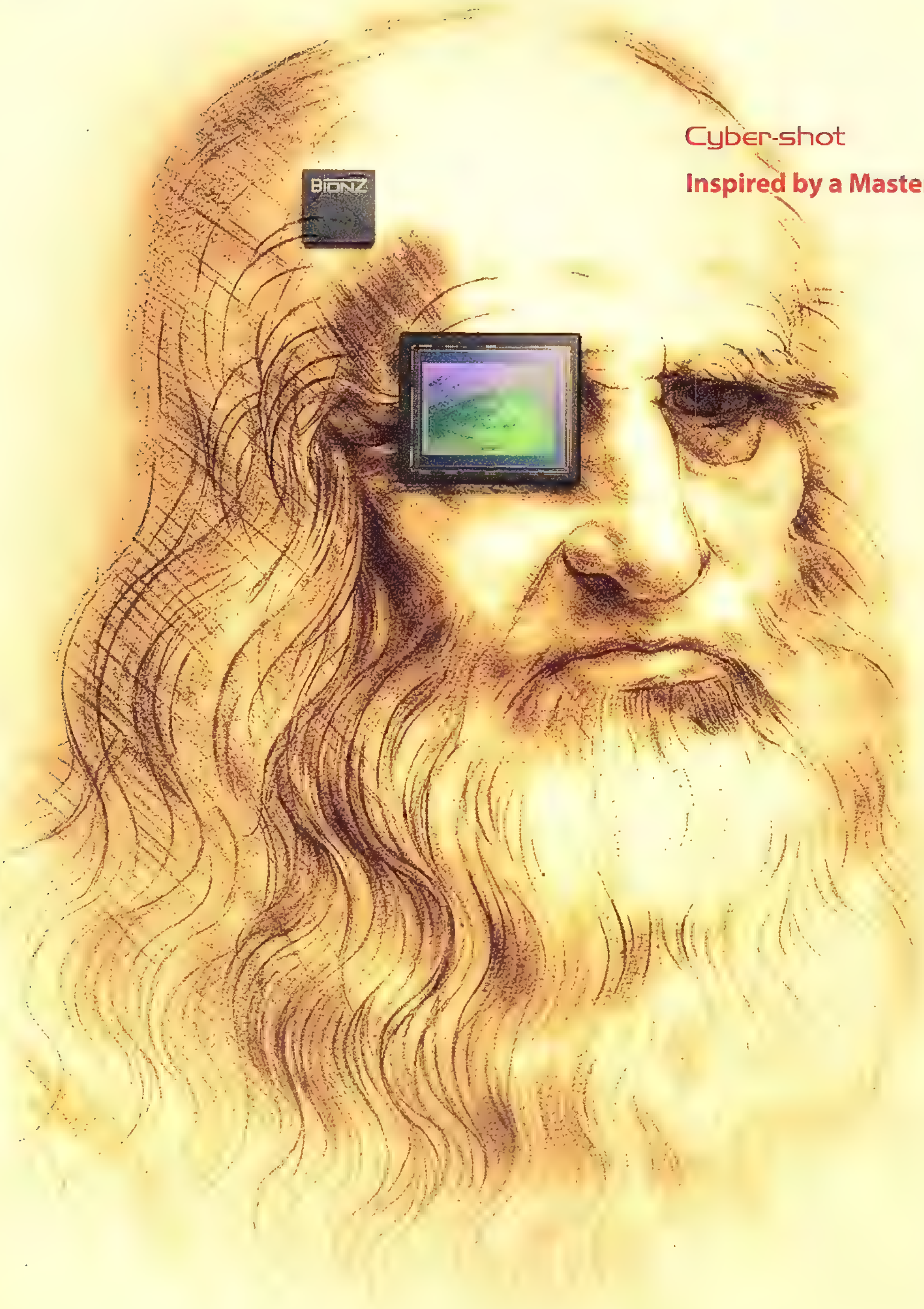

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Cyber-shot

Creator's DNA

atomic What sort of performance/quality differences will gamers see on DirectX 10 and DirectX 9 hardware?
Boyd: Right about now we are seeing performance parity between DirectX9 and DirectX10 implementations, and from here on DirectX10 performance will grow. We are already seeing some image quality improvements due to DirectX10's more precise specification of how the hardware should work, which helps both DirectX9 and DirectX10 games visually. DirectX10's advanced features will enable games to use visual techniques that would be more complicated to implement under DirectX9. For example, improved interfaces allow higher scene complexity for richer, more detailed worlds at a given performance level. At a practical level, DirectX10's more consistent feature set also means more games shipping sooner because of reduced game development times.

> “DX10.1 is a minor update that provides support for new features with minimal code change.”

atomic What advantages are there working with DirectX 10 over DirectX 9?
Boyd: As I mentioned earlier, DirectX 10 includes new features that help developers take better advantage of the GPU, including Shader Model 4.0, as well as providing for a more stable platform all together. Whether a game is built for Xbox 360, Windows, or both, we want to make sure there is as much efficiency as possible. We receive regular input from hardware vendors and constantly update the DirectX SDK to ensure developers can use the latest programming innovations in their applications.

atomic When do you think we'll be seeing the full extent of DX10's capabilities?
Boyd: As new technology enters the market, it takes time for adoption to grow and the full realisation of the potential to unfold. We've seen our development partners do some amazing things with DirectX 10, and with additional driver and hardware support, we're confident that DirectX 10 technology is on its way to changing the way the world looks at computer graphics.

atomic When do you believe we'll have reached the point when the majority of gamers have moved onto DX10 hardware?
Boyd: With more than 80 million copies of Windows Vista in use in the first year and a projected 60 million DirectX 10 GPUs shipped through January 2008, I'd say we have a great start. We are confident that the gaming community understands and appreciates what DirectX 10 offers, and will continue to adopt it.

atomic Some gamers have complained about experiencing reduced performance in DX9 applications in Vista. Is this something that can/will be addressed in Service Pack 1?
Boyd: As of yet we have no information to share on the contents of Windows Vista Service Pack 1. Additionally, game developers and hardware vendors are regularly updating and optimising their games and drivers respectively to continuously improve performance.

atomic Does the fact that current-gen consoles use an older version of DirectX than Vista PCs make multi platform development tricky?
Boyd: Basically, no. There are some new features in DirectX 10 that differ from the DirectX 9 Application Programming Interface, but for the most part we aim to provide developers with a common set of APIs for both the Xbox and Windows platforms. For example, XInput is a common API that allows for easy implementation of support for the Xbox 360 Controller for both Xbox and Windows games. Another example is XACT Microsoft cross-platform audio creation tool, similarly it allows for one API to be used across both the Xbox and Windows platforms. We are also taking steps to ensure easier development for everyone including students, hobbyists and independent game developers. XNA Game Studio Express is based on Visual C# Express 2005 and lets developers create games for both Windows and Xbox 360.

atomic Is there a Microsoft DX10 game console in development? Can you provide a rough idea of when it will be released?
Boyd: We have nothing to announce at this time.

atomic What can gamers expect from DX10.1? Could you explain why the update isn't compatible with DX10 hardware?
Boyd: Unlike DirectX 10.0, which provided major new features that had significant impact on game engines and art pipelines, DirectX 10.1 is a minor update that provides support for incremental new features with minimal code change.
The features included in DirectX 10.1 are an incremental extension; we do not expect applications to depend on these exclusively. All of the features in DirectX 10.1 have fallbacks that are straightforward to implement if native hardware support is not available. We fully expect that all games that leverage the new features will also run on DirectX 10.0 hardware.

I'm on the drug...

Synonymous with the geek lifestyle, caffeine is one drug we seemingly can't do without. But why? **Ashton Mills** investigates.

As I write this I have an empty bottle of V on my desk, and a warm tasty mocha in my hand. Such is irony. I'm pretty average, I'd say, for my caffeine intake – at least as far as geeks go (see Atomic Issue 63, page 31, to see just how far we *do* go). But it's hard to avoid; we find it in most of our vices: coffee, tea, Coke, chocolate, energy drinks, even some mints. As a population, we seem to be quite fond of it, or at least the compounds that carry it. And for geeks, especially, caffeine is all but an essential dietary intake. So is it a good one?

Stimulus

On its own caffeine, also known as 1,3,7-trimethylxanthine, is an odourless and bitter tasting powder with the molecular formula $C^8H^{10}N^4O^2$. It's also the world's most popular and socially acceptable drug.

Contrary to popular belief, tea usually doesn't contain as much caffeine as coffee, but does contain much more of a close relative called theophylline (1,3-dimethylxanthine). It has many of the same effects, but is more diuretic (makes you pee) and works slower.

Theobromine (3,7-dimethylxanthine), which you've probably heard about, is a cousin to both of these but is considerably weaker (about one tenth the effect). It's found in cocoa, and thus chocolate.

Theophylline and theobromine are also smooth muscle relaxants (that is arteries and veins, bladder, gastrointestinal, respiratory tract and more). Which is why your mum always gave you tea when you had a cold.

Theobromine is highly toxic to dogs and overdose can result in death. A few biscuits or bites of cake wouldn't go astray, but a half a kilogram of chocolate would lead to poisoning. And dogs, being dogs, will happily eat out of rubbish bins and whatever strangers feed them!

But back to caffeine – it's not just found in coffee beans. Some sixty different species of plants employ caffeine, where it primarily acts as a pesticide to stop insects eating the plant. Trust humans to come along and get a *kick* out of it.

And as with just about everything, balance and moderation is key: caffeine is toxic and even fatal in high doses. And you don't just have to swallow it; you can also absorb it through the skin (ergo the Alaskan invention of caffeinated lip balm, the *Spazzstick*).

Caffeine is in a class of drugs known as a stimulant (no surprise there), where it primarily affects the central nervous system, increasing heart rate and metabolism, but also helping some muscles to contract more easily. As you know, it gives a feeling of altered-ness and can reduce fatigue. Its effect on the respiratory system is even used medically on occasion.

But it has side effects – mainly it plays with your brain's chemical reactions, binding to the same receptors as adenosine. Adenosine is an inhibitory neurotransmitter, and plays a large role in making you feel sleepy so your body can get some rest. It also affects the quality of sleep, so caffeine doesn't

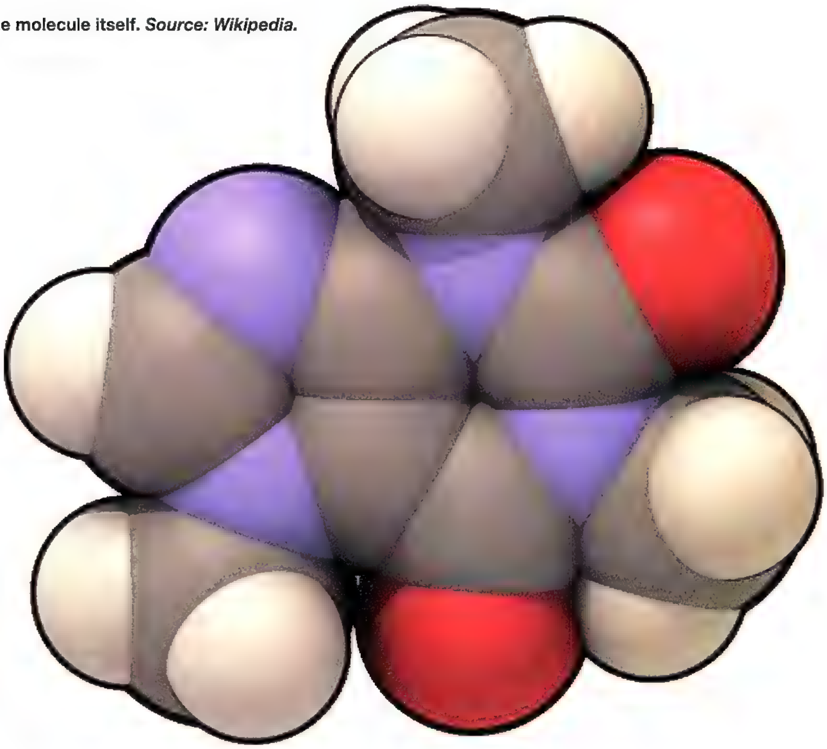
BELIEVE, IF YOU WILL

Coffee is said to have originated from Ethiopia but was cultivated by the Arabians around 570AD, turning into a global trade by the 17th century.

Another legend states that coffee beans were first discovered by an Egyptian goat herder name Khaldi around 850AD. After finding his flock 'dancing' after eating mysterious red berries from a plant he hadn't seen before, he tried them himself and experienced the same buzz.

There's got to be an energy drink name in that somewhere...

The molecule itself. ***Source: Wikipedia.***



just keep you awake longer but when you do sleep its less effective.

Finally it's also a diuretic. This is thought to be due to increased blood flow through the kidneys. Now you know why you go to the toilet more when you've been sculling Vs at LAN days!

Getting the fix

Caffeine is actually addictive in the colloquial sense of the word – it stimulates the brain using the same mechanisms as amphetamines, heroin and cocaine. If you feel like you can't get by without a daily coffee, that's because you can't – without it you'll start to get withdrawal symptoms (more on this below). Similar to these drugs, the more your body gets used to caffeine the less effect it has, and you need stronger coffee to get that 'buzz'.

Most of us get caffeine through food and drink, where it enters the blood stream through the gastro-intestinal tract. It then gets distributed around the whole body, including passing through the blood-brain barrier. It reaches maximum concentration in a about an hour (everything from weight, sex, age and liver health can affect this), and has a half-life of about 6-7 hours, which is why withdrawal symptoms generally take around 24 hours to manifest.

NOT THE ANTI-DRUNK

Contrary to (relatively) popular belief, a strong coffee does not counteract the effects of alcohol on your body. You may feel more alert due to the effects of caffeine on the central nervous system, but the effects of alcohol – delayed reactions, inability to make quick decisions – are also still present. Coffee and alcohol makes you a wired drunk, but a drunk none-the-less!

And what exactly is it doing in your body? Caffeine affects the central nervous system, the brain, cardiac muscle, respiratory system and the kidneys. It increases your metabolic rate by about 10 per cent, increasing the level of circulating fatty acids and in turn enhancing fat oxidation. In other words it can help to turn fat into energy faster, which is why some diet pills contain copious amounts of the stuff, although there's no actual proof this is of any benefit when so many other factors are at play in dieting. Interestingly, women metabolise caffeine about 20 per cent faster than men and for both sexes the effect on the metabolism is reduced the more accustomed to caffeine the body becomes.

In the brain caffeine constricts the cerebral blood vessels. If you're used to drinking several cups of coffee a day and then you quit cold turkey, the body can become oversensitive to adenosine. Since adenosine also helps regulate blood pressure, it can drop, resulting in an excess of blood to the head, causing a headache. Ergo, one of the best known withdrawal symptoms (Oh Gods, tell me about it *–ed*). While it doesn't have an effect on sobering you up (see 'Not the anti-drunk' box), it's this facet that does make coffee good for hangovers – constricting blood vessels may bring some relief from the hangover blues.

While the buzz and sense of altered-ness can

> **“Now you know why you go to the toilet more when you've been sculling Vs at LAN days.”**

OVERDOSING

Like everything in life, it's all about balance and moderation. Overdosing on caffeine can cause a range of side effects, and (although unlikely) can in fact prove lethal in very large doses (approximately 10 grams, or the equivalent of nearly 100 cups of coffee). How to know if you've been having too much? Symptoms include:

* nervousness
* restlessness
* insomnia
* anxiety
* flushed face
* gastrointestinal disturbance
* muscle twitching
* diuresis
* rambling thought and speech
* tachycardia or cardiac arrhythmia

If you happen to feel any sort of cardiac arrhythmia – irregular beating of your heart – you might want to cut back on those Jolts.

Contrary to popular belief, caffeine doesn't look like Coke.

be a nice pickup, there are a range of negative side effects too: insomnia is the most apparent problem given its effect on adenosine. Another side effect can be the 'shakes', the result of an over-stimulated nervous system and probably a good sign it's time to cut back on your drug of choice.

When you do, classic withdrawal symptoms can appear – irritability, inability to concentrate, and restlessness are common. The best thing to do here is drink plenty of water and wait for your body to adjust back to normal.

Enjoying the habit

So now you know what it is and how it affects your body. Is it bad for us geeks? Not in moderation. Even if you're a night owl, it's a good idea not to drink caffeinated drinks in the evening before bed. It's not so much staying up late that's a problem, but getting a restful sleep, which caffeine will prevent you from doing. And better sleep = better geeking the next day! And while this is all terribly responsible of us to say so, it can be hella fun to pull all-nighters at LAN days and do so with your favourite caffeinated drinks; it's just a good idea not to make a habit of it.

And with that, I'm off to get myself another fresh coffee...

WHAT'S GOOD FOR YOU

Well, ultimately, caffeine isn't, but if you're addicted to the drug it helps to know the quantities you'll find in foods. Here's a list of common foodstuffs:

Cup of coffee	90-150mg
Decaf	2-5mg
Instant coffee	60-80mg
Tea	30-70mg
Mate	25-150mg
Cola	30-45mg
Diet Cola	30-45mg
Jolt	100mg (US), 54mg (AU)
Chocolate bar	30-60mg
Stay-awake pill	100mg
Cold relief tablet	30mg

In Australia we have quite stringent limits on the caffeine content of food. For soft drinks, this is 54mg per 375ml can – and why Jolt in Australia is about half the strength of Jolt in the US. By comparison, the limit for soft drinks in the states is four times as high – 200mg. They also contain more sugar, to offset the bitter taste of the increased caffeine. It's not surprising that the average American consumes, from all food sources, roughly 50 per cent more caffeine per day than the average Australian.

TECHNICA OBSCURA

The big picture behind technology and the world around us

Like Hz from stone

Ashton Mills talks about CRTs, LCDs, and IEMs. Are you sensing a pattern?

Last month I covered the nature of frames in X-Ray, and in it I talked about the *flicker fusion threshold* which, for your average person, is around 75Hz. That is, up until this limit you can discern the gap between frames such that the image before you doesn't appear seamless.

This leads us to a bit of a problem. While CRT monitors, nearing the end of their reign on Earth, will happily do well in excess of 75Hz and often as high as 120Hz or more, our new display overlords in the form of LCDs don't.

Yes we love our LCDs for their rich colours, wonderful sharpness, pristine flatness, large up-to-30in gigantanourmousness and so on. But LCD has its weaknesses – contrast ratio (blacks can never be blacks), response time (you think 6ms is good until you see a CRT again) and, lets not forget, a limited display frequency of 60Hz for any decent resolution – more a function of limited DVI bandwidth than panel science.

Like everything else Atomic, if we want the very best for our displays we need to define just what this entails. So we will – lets call it the IEM – *immersive experience minimum.* Just what would make the ultimate display for your immersive gaming experience? We'd need the following: solid frames (no tearing), framerate consistency, and finally an fps equal to or greater than the human flicker fusion threshold.

First up, vsync is essential – it's a no-brainer that a correct image is not only preferred over a torn one, but necessary to fool your brain into not seeing the frames themselves. Even if your beast can pump out 150fps with vsync off, it doesn't mean a lot if it can't hit 60fps with vsync on.

Which leads us to consistency – your eyes and brain are very good at picking up framerate fluctuations so it's necessary not only to hit a high fps with vsync on, but do it consistently regardless of what is being rendered on screen.

Finally the framerate must meet or exceed, of course, 75fps – the human flicker fusion threshold. Indeed, 75fps needs to be the *minimum* framerate across the board.

If you have these three requirements met, you have the most immersive image your hardware can produce.

Only it's harder to achieve than it sounds. First up of course we have our LCDs and their 60hz caps for even midrange resolutions. Yes, 60fps is pretty good, but it's not up to par with 75fps – and you can notice the difference between them (if 60hz was the flicker fusion threshold, then you wouldn't).

Secondly, achieving a solid 60 or 75fps with vsync can require some pretty beefy hardware depending on the game. With vsync buffers are only rendered to the display once complete. If the display needs another update before the frame has finished rendering, the old buffer will be re-sent. Since the frames have to synchronise with the display, this means failure to meet syncrhonisation causes drastic drops in framerate – usually a fraction of the frequency (say 30fps from 60fps). This is why there needs to be enough power to provide frames to meet the display frequency regardless of what's happening on screen (*cough* *Crysis* *cough*). It's also why triple-buffering exists – it allows two frames to be rendered in advance instead of one, greatly enhancing the ability of a machine to meet frame synchronisation (but may also produce 'input lag').

Unfortunately, LCDs shaft us here as well – a fraction of 75hz or 100Hz is still higher than a fraction of 60Hz. So even if a machine can't meet the full frames, but can meet just below this, a higher Hz allows the fraction framerate to still be higher and, in turn, be closer to the flicker fusion threshold – and thus closer to the IEM.

So for now, with current LCDs at least, the IEM isn't possible even if the hardware grunt is up to par – although less demanding games will allow you to get close (60hz, vsync, 60fps consistent minimum). Until we get panels capable of using the bandwidth of dual-DVI to support higher display frequencies (i.e 1920 x 1200 @ 75) and not just higher resolutions (aka 2560 x 1600 @ 60), it won't be possible either. So are you listening Samsung, Dell, BenQ, ASUS and the rest?

> "For now, with current LCDs at least, the IEM isn't possible even if the hardware is up to par."

There ain't no immersion like Ashton's immersion. Oh yeah.

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atomic Motherboard Buyers' Guide

Josh Collins shares his motherboard wisdom with all and sundry – find out what the pros look for in a mobo!

The motherboard is an integral part of the enthusiast computer. It's no wonder then that the motherboard is often one of the most examined, anxiety-packed and generally confusing purchases for a new whiz-bang high end enthusiast masterpiece.

Throughout this article we'll be exploring what features mark the difference between a good, bad and downright shocking motherboard. We'll help you learn to guide yourself through the minefield of boards available to find the gem on the other side. Not only that, we'll explain why certain features will help your choice be the strongest possible 'central nervous system' for your PC.

Component quality

Component quality is a very important aspect when considering a motherboard's longevity and ability to withstand sustained stress in a pumped up, overclocked and over-volted enthusiast environment. This is also relevant for those looking for long term sustainability and functionality in a stock system.

When it comes down to component selection we're talking the nitty-gritty. So we're speaking about solid state capacitors and ferrite core chokes. For those that enjoy the pastime of choking on marketing and sales pitches, you'll have noticed these are the two components pushed by GIGABYTE in its 'Ultra Durable 2' marketing campaign. GIGABYTE is not the only vendor pushing forward with the inclusion of solid state capacitors; it is however the only one (at the time of printing) to use solid state capacitors on all lines from the highest end enthusiast board to the lowest end entry board. This is compared to the majority of other brands either only using solid state capacitors on the high-end boards or purely around the CPU socket area, while relegating the rest of the board's capacitors to electrolytic capacitors.

Motherboards notable for using solid state capacitors include:

GIGABYTE: whole DS range
ASUS: Deluxe, Premium and R.O.G. series boards
MSI: Platinum series boards
Foxconn: Quantum Force and Digital Life series

These boards are a starting selection of mobos featuring solid state capacitors and/or ferrite core chokes.

Power management

Power management is a very important aspect of a motherboard's functionality. If the components, especially the CPU and memory, cannot be fed sufficient power while under sustained and/or burst load power draws the stability will fluctuate and fatal errors become all the more possible and common. In worst case scenarios, insufficient power management can cause system lock ups, blue screens of death and intermittent failures. The power management on a motherboard comes down to some key areas and the method in which that power management is implemented.

One such area is the CPU socket. In the evolution from electrolytic capacitors to solid state capacitors the CPU socket power management phases were the first to incorporate the use of solid state capacitors. Also adding to the consistency of the flow of power to the CPU is the number of power phases. The more phases incorporated results in a more finely managed and sustainable power supply to the socket and therefore the CPU itself.

The use of multi-phase power management has recently made the transition from not only being incorporated in the CPU power supply but also the memory power supply. Until recently, manufacturers would design the memory with a single phase power management system. Since the recent Bearlake-based R.O.G. motherboards, ASUS

has been implementing a two phase power management system. As a result, overclockers have been able to obtain higher memory frequency overclocks and maintain tighter timings at higher frequencies, as well as utilise lower voltage requirements.

An issue with implementing traditional multi-phase count power management and using capacitors and chokes is the congestion caused around the socket area – a particularly annoying situation when focusing on sub-zero insulation. To remedy this situation some manufacturers have been known to implement the use of digital pulse width modulators (PWMs). This can have a positive or negative effect on the sustainability and fluctuation of the power supply. The reason being is that at a lower phase count the capacitor and choke implementation can more easily maintain a smoother fluctuation in power delivery. A low phase count digital PWM configuration can incur harsher fluctuations as the flow is modulated, and therefore fluctuations in the sustained supply of the power. This can be remedied by increasing the phase count on the circuit setup.

Motherboards notable for implementing quality power management:
GIGABYTE: DQ6 series range
ASUS: Deluxe, Premium and R.O.G. series

Motherboards notable for implementing digital PWMs:
ASUS: Select R.O.G. series boards - Blitz Formula/Extreme and Commando
Foxconn: Upcoming X48 based Quantum Force BlackOps board
DFI: LanParty UT P35-T2R, LanParty UT X38-T2R

Upper board spacing, restrictions and layout

An important consideration for a motherboard is the placement of all the differing components and pieces that come together to make a single, unified and functional motherboard. There is so much to keep in mind when determining the component layout for the board: what parts will restrict others, how much space is needed between two given

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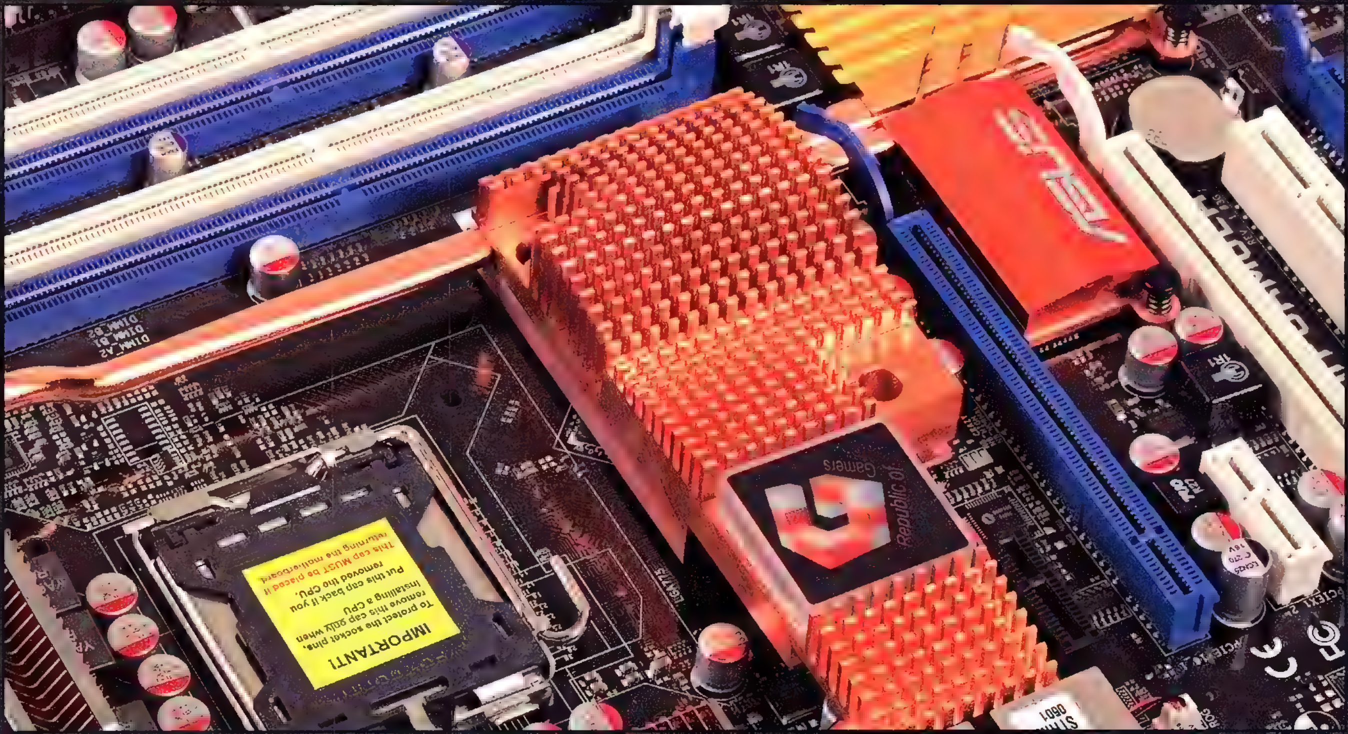

> **"If the socket is too close this could result in issues with third party heat sinks."**

points and an ever increasingly important thought is whether the end result is functional from a system building perspective.

It's obviously important, but what kind of layout considerations should a prospective buyer be mindful of and looking for? One such is the space available between the CPU socket and the edge of the memory DIMM slots. If the socket is too close this could result in compatibility issues with third party heatsinks and/or be a hindrance due to the need to remove the CPU cooler to simply remove or adjust the DIMMs. An additional worry for third party heatsinks, or at least what orientation they can be placed in, is the distance the CPU socket area resides from the top edge of the motherboard PCB.

Another important restriction to be mindful of is the possible issues from large North Bridge and VRM (volt regulating MOSFETs) cooling. This can be due to large passive heatsink skyscrapers or from oddly intertwining heatpipe jungles. This particular issue isn't so much a problem in the current market as past faux pas have both taught offending manufacturers and in turn taught the competition what is acceptable and what is not. None the less it's worth being mindful of this and if there is concern regarding the compatibility of a given motherboard and heatsink combo, be sure to check out enthusiast forums for some user feedback. If this cannot be obtained, use the contact details listed on manufacturer websites to obtain support for the question – assuring you obtain two products happy to play ball with one another.

If you're the type to tweak and fiddle with the setup of your system a spacing consideration worth giving some thought is the spacing between the back of a large GPU in the primary PCIe 16x slot, for example the 8800GTX, and the fully extended length of the clips used to secure the DIMMs in place. As small as this may sound, there is nothing more frustrating than having to completely remove a GPU simply to add/remove sticks of memory.

The EIDE, or commonly referred to as 'that plug I put the cable in for my optical drive', is slowly but surely being phased out. None the less, as affordable SATA optical drives flow into the market, the legacy PATA optical drives, and even HDDs for some individuals, still need to be hooked up to the system. This means large cumbersome PATA ribbon cables need to be accommodated and as such, good placement of the EIDE connection is important and on a good board is generally kept to the upper right edge and grouped with the ATX 24-pin power connection.

This brings us to the next area of consideration for the upper sections of the motherboard's layout – the power connections. The common connections for a motherboard's power supply are through the ATX 24-pin and EPS 8-pin connections. It is not limited to this, however, some boards supporting multiple GPUs also include an additional 4-pin power connection for further power supply to the board's circuits to help maintain smooth power flow and management while under the strain of an additional GPU. Good placement of the power connections can make for much easier cable management within a system.

Look for boards with the ATX 24-pin along the upper right hand edge of the motherboard and the EPS 8-pin connection in the upper left corner behind and between the rear I/O ports and CPU socket area.

Lower board spacing, restrictions and layout

Moving onto the layout of the lower portion of the motherboard there is a distinct bias towards one particular design. This is the placement of expansion slots to the left area, additional and optional I/O connections across the bottom edge (e.g. extra USB and FireWire connections) and SATA ports and additional connections and switches towards the right edge.

When considering the PCIe 16x spacing be mindful of the slot's relationship with the rest of the expansion slots. Keep in mind the allowance for adequate cooling for single and dual slot coolers. Additionally have an idea of what slots would be effected by large coolers – are these slots expendable or are they necessary?

For example, many manufacturers now place PCIe 1x or PCIe 4x slots below the PCIe 16x slots and maintain the PCI slots above or two slots below a PCIe 16x slot to assure PCI expansion availability, due to it still being the primary expansion slot for the likes of sound cards, network interface cards and TV tuners.

Lastly the spacing between PCIe 16x slots on a motherboard supporting multi-GPU configurations is yet another consideration when perusing for a new board for that monster rig. Is there sufficient space between the GPUs? Will the primary GPU's cooling mechanism be suffocated or restricted by the close placement of the secondary GPU? The expansion slots may look simply thrown on the board but considerable layout thought must be given.

Now that the necessary considerations have been outlined it's a matter of seeing what type of layout accommodates your needs. There are generally three options and are largely dependent on other features on the motherboard. These three options are to either utilize five, six or seven expansion slots for the slot layout. Many of the mainstream boards now incorporate a six expansion slot setup and with ever growing multi GPU systems, this is getting rather crowded. It's for this reason that many of the luxury high-end motherboards with support for 3-Way SLI and CrossFire X utilise a seven slot expansion layout, allowing for three GPUs with dual slot coolers to sit side by side, albeit a little on the warm side.

As mentioned, the SATA ports are commonly placed along the right side of the lower region of the motherboard. Placement of these ports needs to be given considerable thought; if a SATA port is placed directly behind an expansion slot inline with a PCIe 16x slot in particular; there is a high risk of losing access to a port or two. This loss of ports is due to the expansion cards extending further back than simply the length of the slot itself. To avoid the issue completely, some manufacturers not only push the placement of the ports to the very edge of the board but also then shift the connection onto a 90 degree angle. This not only avoids the issue of expansion card interference but also adds easier cable management and greater overall system presentation.

For any overclocker that pushes the boundaries of their system, be it for a stable air cooled or water cooled 24/7 setup or looking for the outright maximum with extreme cooling such as dry ice, cascade and LN2, they will undoubtedly become good friends with the CMOS battery and CMOS clear switch. The need for easy access to these parts is extremely important for the overclocker and bad placement of the CMOS battery and CMOS clear switches can make an otherwise well-designed board an utter nightmare to deal with – note to manufacturers: no one likes to have to remove GPUs just to get to a CMOS battery or clear switch. Best placement is often towards the lower right corner of the board, with thought given to extended GPUs and other expansion cards, as well as ease of access when in a full system build.

An ever more prominent inclusion in today's enthusiast motherboards are switches and buttons to not only control aspects such as CMOS clear but to also give a method to turn the system on/off or reset the system when benchmarking on an open test bed; or any other situation where case switches have not been connected to the front case I/O headers. Again, due to the switches being included in the lower portion of the board layout, it is important to ensure the switches are not obstructed by expansion cards – there's no use in having easy to use switches/buttons if they're not easily accessible.

Product support

This one is fairly simple but if you're going to spend your hard earned dollars you want to be sure that support for the product is there.

Product support can cover many aspects of the post sale experience provided by the manufacturer. Support can be provided in areas such as trouble shooting, quick setup guides, overclocking guides, BIOS updates and development and most obviously warranty support should the need arise.

There are a number of brands well known for great support. Foxconn

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Thermaltake's new DH series desktop cases are designed to be complete digital home theatre systems. Each case boasts piano-mirror surface-finish with aluminium front panel design; high efficiency ventilation in the form of a 12cm silent fan at the front and dual 6cm fans at the rear; stylish gold-plated foot stands; tool-free design for easy installation; 1 x 5.25" external drive bay & 3 x 3.5" internal drive bays; 7 expansion slots and compatibility with Windows Vista, MCE remote & keyboard. Moreover, the DH101 case boasts an in-built Media Lab LCD with hot keys module whilst the DH102 premium case features an in-built dual-monitor display and 7" touch-screen functional control with 10 hot key buttons.
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is high up the list; with its recent focus on the high end market and the introduction of the Quantum Force product range the company has displayed a consistently increasing focus on the enthusiast sector and offers tutorials and guides to overclocking its motherboards. Other notable manufacturers that no doubt come as no surprise are the likes of ASUS and GIGABYTE. Both companies have built a strong reputation on R&D and this R&D flows through into quality end products, as well as offering consistent updates, such as a constant flow of BIOS improvements, to further increase performance. However you have to go through a virtual maze to get to the ASUS BIOS updates.

Availability

There is no use having a product on the market if no one can get their hands on it – ask any early adopters of the 8800GT 512MB! The availability can also at times be reflective of a product's support from the manufacturer. A small presence in a given market can echo a small or low-level support network for that product.

Availability can also force price alterations. Too little product and a premium will be attached; too much stock and the price will need to adjust so as to sell off excess stock. It's all too often that as enthusiasts the boards we're interested in are the boards in short supply – be mindful of this when purchasing and decide whether the premium is worth the current availability or whether it would be better to be patient. This can pay off, however be careful of slipping into the "Yeah, but there's a new board just around the corner" mindset. Do this and the potential is there to never buy!

Price

A good motherboard should provide a level of value appropriate for the system build. Often due to the equation between availability and price, the premium high-end kit brings with it a rather low 'bang for your buck' index. That being said, you would be the owner of the hottest gear on the block.

Juggling the price of a given component can be a tricky game. Deciding whether it's best to shave costs where possible for that higher level GPU or more memory is often another factor within not only a motherboard choice but a whole system build.

When selecting a motherboard be mindful of the features that will actually be used and the features that are simply further frills. Another factor to this is whether the BIOS options of a premium board are necessary for the goal of the system – some of the strongest budget gaming systems are built around quality lower end motherboards such as the GIGABYTE GA-P35-DS3P.

If overclocking, take into consideration your own ability. This 'ability' is both a reference to your knowledge to achieve a given overclock, the sustainability of said overclock and rounded out by the cooling potential for the system and part or parts being overclocked. A good example is James 'pro' Trevaskis from extreme overclocking crew Team.AU; he smashed through a number of world records using a low-level ASUS P5K. He did so by volt modifying the board to supply the necessary voltages not otherwise available through the BIOS options supplied – the best overclocks don't always use the highest of the high-end kit.

Conclusion

So there it is. A motherboard buyer's guide; the beautiful thing about choosing the perfect board is that the general concepts don't tend to change all that rapidly. We've had the ATX form factor sitting firmly in the market for over a decade now and it continues as the dominant design. BTX remains an OEM form factor due to enthusiasts maintaining that ATX lovin'. However we could be seeing the start of a big change as enthusiast boards such as the ASUS Maximus Extreme use an Extended ATX (EATX) form factor simply to keep the components on the board. Additionally, with Foxconn previewing a board at CES that is based on a longer length than the ATX form factor so as to utilise further expansion slots for GPUs, it can't help but to feel like a form factor revolution is coming, driven by enthusiast demands.

The motherboard scene is ever changing as we've recently witnessed the P35, X38, 790FX and 780i chipsets flow through. Now we await the coming of the X48, 790i and other future chipsets, all while current ranges get refreshes.

The enthusiast market, like the whole IT industry, is a turbulent place. Be mindful of upcoming products but do not allow them to rule a selective choice into a perpetual wait. Buy when the time is right for you and be happy with your new piece of kit!

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HARDCORE

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NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

Hardware. It's a funny old game, making your living off, and loving playing around with, hardware.

This month is a wonderful case in point. We've got some of the most screamingly powerful kit you're likely to find this side of a Cape Canaveral. Skulltrail is simply the most stupidly specced and shamelessly overpowered thing we've ever seen – and we want to have its children. It's great seeing all this stuff as early as we do, but the flipside as that a lot of the gear we get is early release engineering samples.

And nothing makes us cry more than watching an engineering sample melt.

We've not had anything go quite that wrong, but we do ask that you raise a glass, and say a prayer, for Josh's sanity. It's been a tough testing month...

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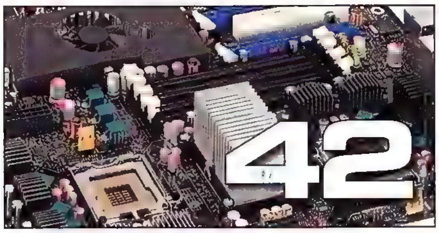

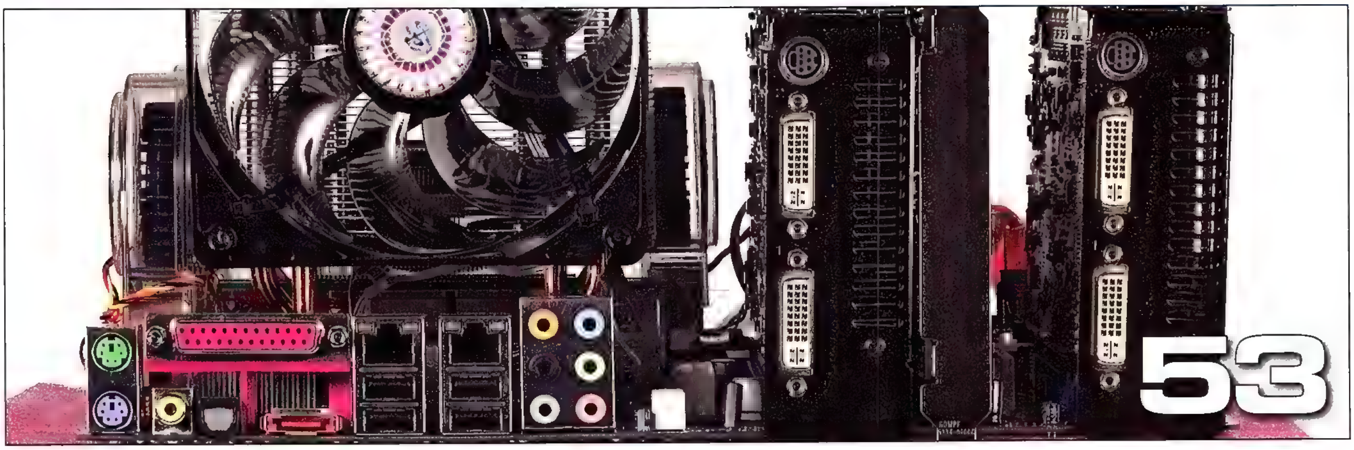

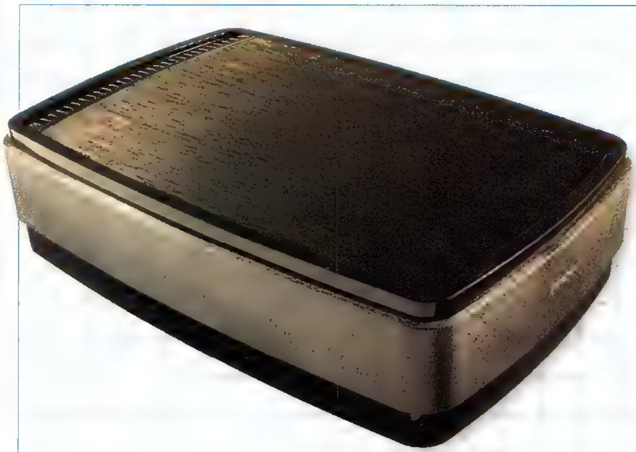

◀ MX-1 VERIS Actively Cooled Hard Drive Enclosure

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It can be a hard and lonely world for a hard drive without a home. Daily, they are preyed upon by all manner of predators, threatened by starvation and cold and forced to endure all manner of torment. Please... won't somebody think of the hard drives?

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Buttkicker Gamer ▶

Price $298 Website www.mittoni.com.au

Frankly, we're inclined to give any product called the Buttkicker a free pass. I mean, with a name like that, you could be anything, and still be cool. But our love of petty cursing aside, this heavy piece of gaming kit is actually kinda cool.

For anyone out there who really digs getting a tactile sense of immersion into their games, the Buttkicker (hee!) is a great toy. It's a two part system, one part being an amplifier that plugs into your PC, Xbox or PS2 and the other a curious little device that, well, looks kinda like a robotic baby's arm holding a metal apple, which attaches to the center post of your desk chair. It can be used with music, and even with headphones plugged in; what it does is deliver the rumble of bass sounds directly into your seat and into you. Cool for music, even better for gaming, where those explosions, rumbling vehicles and ominous musical interludes can be pretty much guaranteed to thrill – and possibly loosen your bowels.

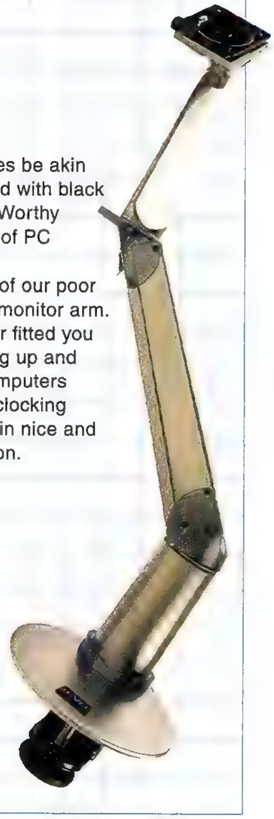
Regardless of any bowel loosening (or, perhaps because of...), this one gets the Atomic seal of approval.

Evo monitor arm ▶

Price $299 Website www.lcdmonitorarms.com.au

Getting your monitor into the right position can sometimes be akin to tackling a jigsaw with all the corner pieces missing and with black ink spilt on half the pieces. Kinda tough, in other words. Worthy solutions in the Atomic HQ include phone books, stacks of PC Authority back issues and slow moving accountants.

While certainly useful (and plain amusing in the case of our poor accountant), these solutions are not a patch on the Evo monitor arm. It simply clamps into your desk, and with an LCD monitor fitted you have a handy, easily adjustable monitor that can be slung up and out and down and all around the joint. Very handy for computers that regularly have a lot of work done on them, like overclocking benches, so that you can swing the monitor away to get in nice and close when you pop a MOSFET during a sub zero session.



▲ Noctua NF-P12 fan and NT-H1 paste

Price $32 & $13.50 Website www.mittoni.com.au

Keeping yourself cool is an important proposition. But, frankly, if you've a choice between keeping your physical self at standard operating temp, or your precious-precious PC, we all know who's going to win out.

Noctua is newly come to these shores, fresh from the... um... strudel covered hills of Austria. On show this month is a 120mm fan and a stick of premium grade thermal paste. The fan hits an impressive 1300rpm while still clocking in as a surprisingly quiet fan thanks to nine blade design with impressively named Vortex Control Notches. No crazy, uncontrolled vortexes drinking all your booze with this fan! The notches scatter and stagger the vortexes produced by the blades, making them both quieter and heard across more frequencies, which leads to what little noise it makes also being far less annoying.

The paste is a specialist mix of micro-particles designed to offer short burn in and long life under the coldest of conditions. Hmm, Pastey!

Belkin Flip DVI KVM Switch

Price $139 **Website** www.belkin.com.au

The clever clogs at Belkin just keep on coming out with great little toys to make computing life that much easier. One of our favourites is the Belkin Flip KVM, which is not only very well designed from an aesthetic point of view, but also works like a bloody charm. You can't ask for more!

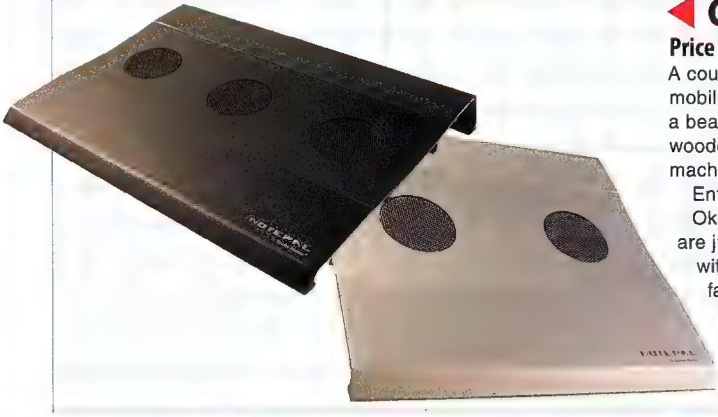
But, Belkin has given us more anyway! The Flip DVI KVM Switch offers, perhaps not unsurprisingly, DVI connectivity. This latest version of the Flip works just like previous ones – plug your speakers, mouse, keyboard and monitor into the base, then plug that into two computers. Attach the wired remote to the side of your monitor or somewhere else convenient, and away you go. Mac types will also be pleased to know that the Flip is compatible with the oh-so-pretty Apple Cinema Displays.

Mediabank 3.5in Portable HD Media Player

Price $86.90 **Website** www.anyware.com.au

Hear's another nifty little Welland drive enclosure that'll be super useful for anyone with a spare drive floating about. The Mediabank is essentially an external drive with pretensions of being a star entertainer; it features one-touch backup built on, for added data security, but more importantly it boasts some non standard drive outputs, which is where the Media Player bit comes in.

The Mediabank has audio and video connectivity so that, once you've got some movies, music or photos on there, you can simply unplug it from your computer and carry into the loungeroom – or wherever else you dirty perverts might have a TV. Plug it in, and you can watch MPEG1/2/4, or Dvix/Xvid V5.0 and below movies, listen to MP3s or browse some holiday JPEGs.



Coolermaster Notepal B2 & W2

Price TBC **Website** www.coolermaster.com.au

A couple of issues ago we were lucky enough to have a play around with Dell's mobile gaming powerhouse, the M1730. It was a beast of a laptop, and it output a beastly amount of heat into the bargain. This is bad enough for your lap or any wooden surface, but it's even worse for system performance – particularly for a machine that's as overclockable as the M1730.

Enter… the Notepal!

Okay, not such a grand sounding name, but these two little notebook coolers are just what the heat-struck doctor ordered. The B2 is the smaller of the pair, with two fans set into its angled aluminium body, while the W2 has three. All fans are 80mm models, and each unit has a power button to turn on and off and a couple of USB ports to add a touch more connectivity – never a bad thing, these days. Word of warning, however – these are designed for desk work, as the coolers do not have anything covering the fans. Might be a little dangerous for resting in your lap…

Gigabyte ATI HD 3870
PCI-E 512MB
From;
*$445

INTEL CORE2DUO
E8500 3.16Ghz/1333
From;
*$438

Viewsonic VA2226W
22" LCD Monitor 5MS
From;
*$338

Logitech G9 Laser Gaming
Mouse
From;
*$118

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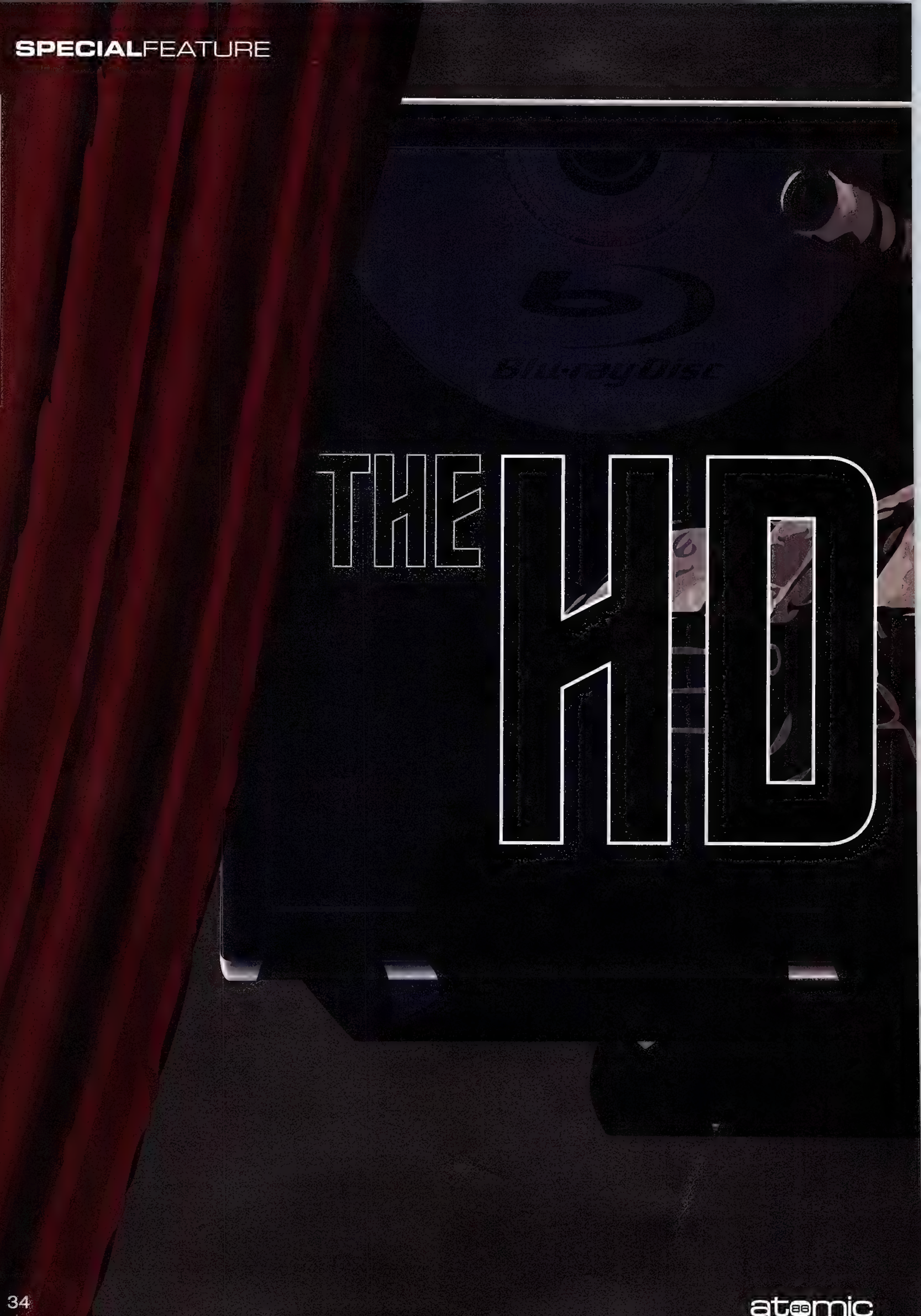


THE HD

WARS

Jake Carrol adjudicates the bitter battle between the two big boys of next gen vision and data.

Many insects have compound eyes, in that their viewing devices are made up of hundreds of modules. The more of these modules that exist, the higher the 'resolution' the insect can view the world in. Think of it as an organic version of a charged coupled device (CCD). Humans on the other hand process light through our eyes in large chunks. We don't see broken up images or segments at a time. We see whole snapshots or 'pages' in as much detail as exists. It is this non-lossy nature of the way we see, with ever increasing sensitivity, that has us craving higher definition images on our computer screens and panels, while television networks and multimedia companies suggest to us that we want High Definition (HD) media. Faced with this, we decided to pull apart every conceivable aspect of this high definition revolution.

Highly Defined

'High Definition' was a term coined long ago. It wasn't a term that had anything to do with video cards or optical disk technologies. HD is a cover all term describing the resolution of an output device. Before most of us were born, HD technologies were in development within several television networks. The first instance dates back to 1949 in France where a public television network started broadcasting 819 horizontal lines of resolution. The next attempt at HD video came from Japan's NHK labs in 1969. In 1983, a working group was formed to establish a singular standard for content and viewing technology. It was not until 1998 that the first HDTV appliance went on sale in the USA.

While this was a step forward, only around one hour a day of HD content was actually being broadcast. As a result of this lack of content, the push to raise awareness for a new medium fell on deaf ears. The world slowly sunk back into the murky depths of Standard Definition. These SD broadcast streams have a resolution of:

- 480i
- 480p
- 576i
- 576p

High Definition, on the other hand, currently comes in several variations. They are:

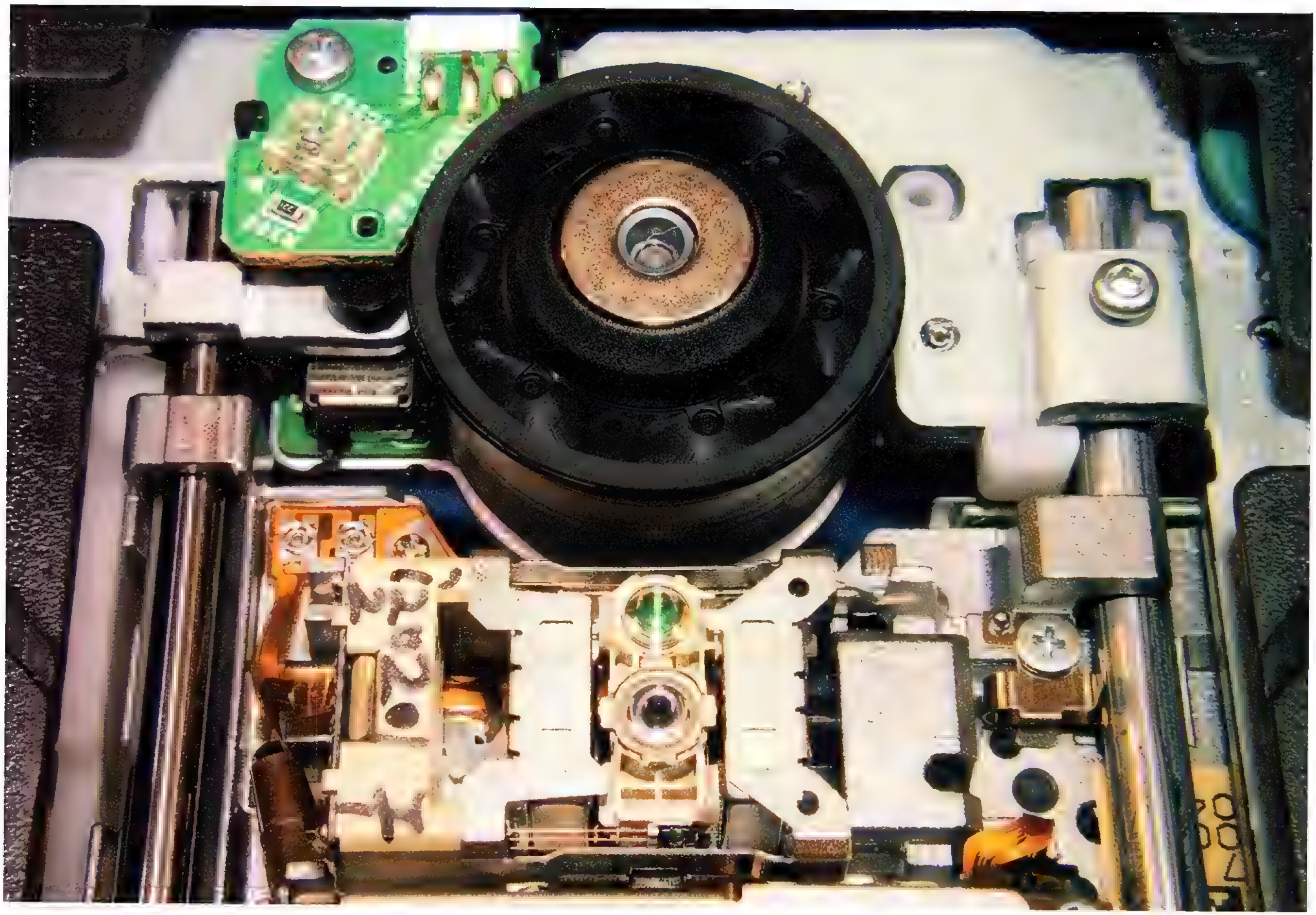
- 720i
- 720p
- 1080i
- 1080p

These numbers define the horizontal number of scan lines viewable on the display or output device at any one time measured on a per pixel basis. That is, a 1080p capable display must have a minimum resolution of wxyz * 1080 pixels to accommodate for a 1080p HD frame buffer. In keeping with the requirement of a 16:9 aspect ratio, or 'letterbox', a resolution of 1920 x 1080 has been adopted as the standard 'full' HD resolution. The difference between the 'i' and 'p' designation is interlaced and progressive output. Progressive scanning redraws all of the lines in a frame buffer when refreshing the image. Interlaced scanning redraws the image field (every second line in the frame buffer) when refreshing, then redraws the remaining lines during a second buffer parse a 60th of a second later. The reason interlaced images appear 'normal' or 'whole' to us is actually an optical illusion. Image interlacing exploits the 'after-image' effect of the chemical Rhodopsin in the human eye, creating a delayed 'whole' image as the eye recovers from the previous parse. The difference between an interlaced and progressive output is slightly more obvious in fast motion video such as sporting events or highly detailed slow motion images. As a general rule, progressive scan is a preferable option to HD connoisseurs. Unfortunately for us, the television networks do not as yet broadcast content at 1080p, opting for transmissions at 1080i. A number of factors including bandwidth allocation, hardware support and lack of content are the underlying reason for this.

War, peace, love and media

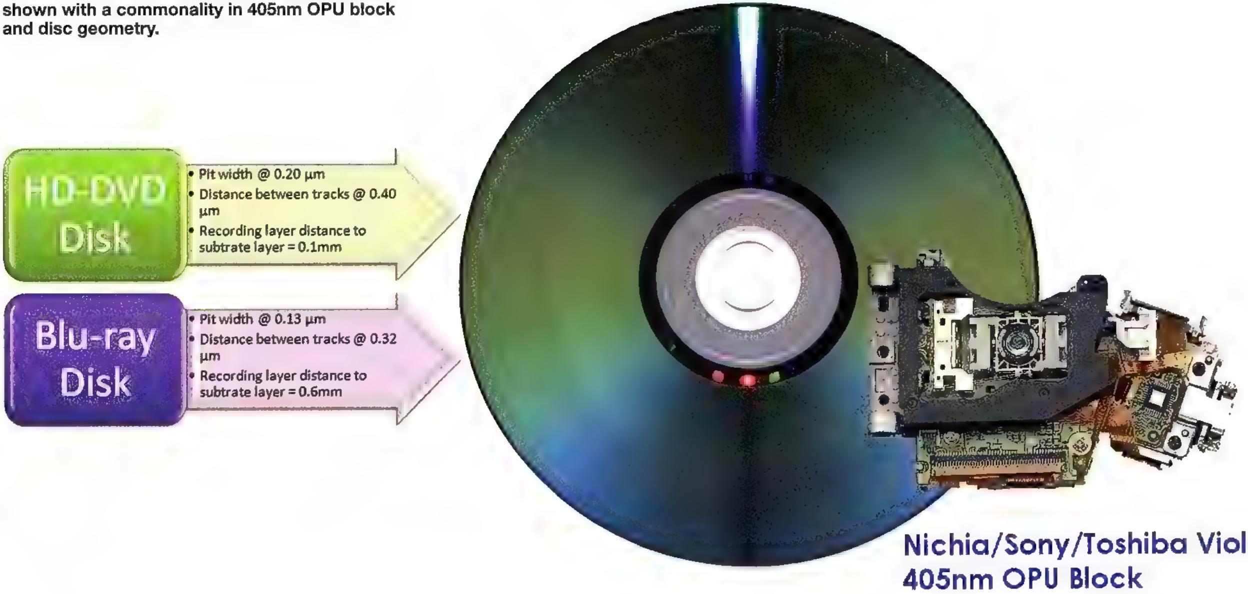
Unless you've lived under a rock for the last two years, you know that we are in the middle of a war, one that revolves around two rival optical factions. HD-DVD and Blu-ray disc are the two 12cm DVD-like proprietary disc formats competing for space in your living room, and to a lesser extent your optical drive bays. Which receptacle will ultimately prove more worthy in the consumers eyes?

It depends on who you ask, what they know and where you live. Simply put, HD-DVD and Blu-ray disc are both capable of outputting 1080p full HD video and high quality audio to your



LG's hybrid HD-DVD/BD-ROM optical pickup unit (OPU) assembly. This assembly has two unique discrete lasers and focal lenses, allowing CD/DVD write, as well as BD/HD-DVD read. Note however that the OPU does not need two lenses for HD-DVD and Blu-ray disk (else, we'd expect to see three lenses!), as the wavelength is a constant of 405nm. All that changes between BD and HD-DVD is the focal length/depth of the read between the two formats. In the top left hand corner, we can see a dual LED, used for detection of LightScribe media barcodes in the H20L model.

Blu-ray disc and HD-DVD format specifications shown with a commonality in 405nm OPU block and disc geometry.


HD-DVD Disk
• Pit width @ 0.20 µm
• Distance between tracks @ 0.40 µm
• Recording layer distance to subtrate layer = 0.1mm
Blu-ray Disk
• Pit width @ 0.13 µm
• Distance between tracks @ 0.32 µm
• Recording layer distance to subtrate layer = 0.6mm

Nichia/Sony/Toshiba Violet laser 405nm OPU Block

viewing/listening device. Fanbois, please leave your bags at the door.

Transporting the bits

So we have our standard for HD viewing and a medium for storing it. Now we need a way to get it from point A (storage medium) to point B (processing/playback mechanism). With a typical resolution of 1920 x 1080 (2073600 32-bit pixels per frame), the storage medium required to encapsulate such a large amount of data needs to be both scalable and fast. The maximum multiplexed rate of the BD-AV MPEG2 transport stream is ~48Mbps (megabits per second), which is easy enough to accommodate for each logical sector running 2048 bytes at 1920 x 1080 @ 32-bits per pixel. In a similar fashion, HD-DVD's raw multiplex stream rate reaches a maximum of ~31Mbps for the entire data and audio stream. While significantly less than Blu-ray, this is still more than enough to cope with a 1920 x 1080 progressive scan output and audio of either Linear PCM or DTS-HD standards.

Same but different

Manufacturing

Both HD-DVD and Blu-ray share the same wavelength of their optical pickup unit (OPU) at 405nm. In theory, this means they can pack data as densely as each other on an equally fabricated optical storage medium. It all falls apart here, however, as their physical disc structure differs. As a result of this difference, Blu-ray can store 25GB per layer, whereas HD-DVD can store 15GB per layer. This data density discrepancy begins to explain the I/O difference and the ~14Mbps transfer rate difference between the formats at '1x' speed. HD-DVD's seemingly less future-proof design was intentional though, in that the fabrication technology used to stamp a HD-DVD is identical to that of a standard DVD. This is not the case for Blu-ray. As a result of this similarity between HD-DVD and DVD media, stamping factories have found it easy to retrofit or upgrade hardware for the HD revolution. On a microscopic level, the differences in track pitch/width and Numerical Aperture (NA) make up for the data-density difference. Refer to the above diagram.

Video and Audio

In terms of video compression and codec utilisation, HD-DVD and Blu-ray Disc are very similar. Both formats support H.264, VC-1 and MPEG-2 as well as Dolby Digital, PCM and DTS for audio. Blu-ray's greater physical capacity affords it an option to encode video data at a significantly higher bit-rate than HD-DVD. Translated to what we would potentially see on an LCD/Plasma screen, this can result in less artifacting and smoother colour graduation in high-resolution video. Thus far however, direct comparisons between the same film in HD-DVD form and Blu-ray Disc form haven't shown such a situation. Despite both being capable of Dolby Digital, L-PCM and DTS, the formats have significant differences in the detail of their audio encode/decode specifications.

Lossy codecs:

First, the lossy audio codecs. As a backwards compatibility mechanism, Blu-ray Disc allows for traditional 640Kbps Dolby Digital audio, with an optional (and rarely used) 1.736Mbps higher resolution version for audio tracks with greater than 5.1 channels of discrete audio. This is in contrast to HD-DVD's 3Mbps mandatory Dolby Digital Plus encoding scheme used across the board for all multichannel lossy audio.

Lossless codecs:

BD has standard 5.1 linear pulse code modulated audio (L-PCM). This is the only lossless format that is mandatory for Blu-ray Disc players. Blu-ray Disc also has extended support for both Dolby TrueHD encoding and DTS-HD Master Audio for eight channels and above. HD-DVD also has lossless support for L-PCM audio but it mandatorily enforces Dolby TrueHD for lossless encodes. Currently however, only 19.5 per cent of HD-DVD movies on the market exhibit this lossless audio functionality.

We were framed!

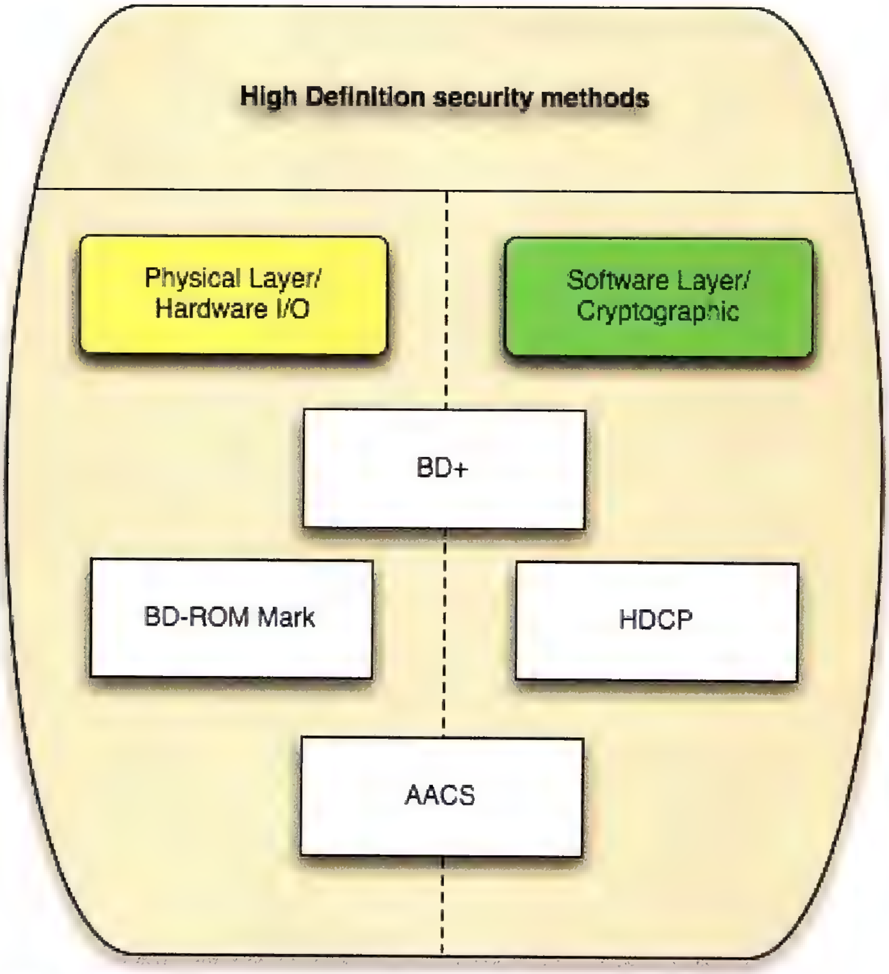
The frame rendering specification for both formats becomes complex when we consider the frame rate at which full motion video is played back. Both formats support 24 frames per second in progressive scan line rendering (24p) in some way. Blu-ray Disc supports 24p with native progressive timing, whereas HD-DVD uses 60i timing for 24p (the source video is encoded progressively, replacing missing image fields with repeating-field markers). Decoders inside video hardware are capable of ignoring these markers to output 24p. The only difference here is that the storage space of a HD-DVD volume encoded using the 60i method allocates more sectors per frame of data. For architecture efficiency purists, HD-DVD uses a 'wasteful' storage mechanism.

A region divided

HD-DVD has no region encoding currently. Any disc from any country will play in any player. Blu-ray Disc enforces region protection currently, with the similar restrictions to traditional DVD. An example of this is that a USA designated Blu-ray Disc will only work in an American designated Blu-ray Disc player. DVD broke the regions into 0, 1, 2, 4 and 5. Blu-Ray Disc breaks the regions into A, B and C.

Don't get all DRM on me man

Time for the fun stuff. Both HD-DVD and Blu-Ray Disc feature an impressive array of security technologies, designed to prevent consumers


High Definition security methods
Physical Layer/ Hardware I/O
Software Layer/ Cryptographic
BD+
BD-ROM Mark
HDCP
AACS

Hardware and software level security abstractions are sometimes ill defined, as AACS and BD+ use in-hardware key stores in order to authenticate. Certain very early hardware such as Pioneer's BDR-101 unit's had no AACS hardware AACS keys thus allowing unencrypted streams to play back or be 'ripped'. This was of little concern however, as the units were generally considered an 'engineering sample' only device.

from 'ripping' or 'illegally transporting' the source content via any other medium apart from the retail purchased disc. These technologies can be categorised into hardware and software level abstractions, representing physical protection methods and cryptographic/key level protection strategies. See diagram right.

The Advanced Access Content System (AACS) is a physical layer mechanism embedded in the disc media. The intention of the protection mechanism is to simply prevent 'ripping' in a similar way to the task CSS performed way back in the early days of DVD. A critical difference, however, is that AACS relies upon a two part interchange, thus requiring hardware internal to the device.

Next, BD+ is used as a cryptographic checksum means of preventing playback on unauthorised devices. BD+ can best be described as a byte-code virtual machine embedded in hardware and executed in software. The applications of BD+ are far reaching and complicated. Some functions of BD+ include:

* Running small self-enclosed executables to probe the host environment (checks global level checksums).

* Check that HDCP/AACS keys have not been changed.

* Transforming audio and video output depending upon the playback or processing environment.

* Key and device revocation (see http://www.atomicmpc.com.au/article.asp?SCID=14&CIID=39170&p=1).

While BD+ has a unique and powerful set of features, it has proven problematic for many players and playback devices. Several manufacturers have issued firmware updates to fix playback problems as a result of BD+.

Adding to the complexity of illegal reproduction of BD-ROM retail media, BD-ROM Mark is a physically non-reproducible set of bits on an inaccessible location of the BD-ROM stamp. As a result, BD-ROM/RW drives in both PATA/SCSI/SATA form cannot make a 1:1 bitwise copy of such a disc. Ergo, a 1:1 perfect copy of such a media type cannot be produced. At the output protection layer, High Bandwidth Digital Content Protection (HDCP) stands in place.

HDCP (http://www.atomicmpc.com.au/article.asp?SCID=14&CIID=39170&p=1) is yet to really show its true colours to the growing market. If the HDCP flag is enabled on a Blu-ray or HD-DVD disk, not only will the disc not output video or audio on a non-HDCP compliant display, but has the potential to down sample output resolution to standard definition (SD) resolutions. In what seems to be a repeat incident of the recent BD+ issues, many HD-DVD and Blu-ray Disc players have suffered problematic playback issues at the hands of HDCP, even when the user has a HDCP compliant High Definition Multimedia Interface (HDMI), panel and video processor.

HD-DVD is very similar in implementation, apart from lacking a physical mark (such as Blu-Ray Disc's BD-ROM Mark). AACS and HDCP are implemented identically across both formats. HD-DVD also lacks the extended virtual machine style BD+ technology, not featuring such software complexities.

There is a caveat to all of this. Many of these technologies, including BD+, HDCP and AACS rely on some form of key-exchange technology (typically AES) to take place between the storage medium, the read back device and the output device. Herein resides a weakness. Within days of the respective formats being released, AACS keys were usurped via insecure or weakly protected key interactions from software such as WinDVD. Following this train of thought, a similar method of 'discovering' keys was also made possible where HDCP was concerned. BD+ fell victim to a similar fate, using surprisingly similar key sniffing techniques.

The most startling part about all of this was the fact that many of these key exchanges were made in cleartext (a term used where text is non-

FIXES FOR FANBOISMS

1. There is a notion that HD-DVD has better 'interactivity' as a result of the HD-I format. This isn't the case. Blu-ray has the same capabilities, albeit in the Java programming language, from Sun Microsystems, running in a virtual machine.

2. HD-DVD does not have worse image quality as a result of a lower video stream bit-rate in real world subjective tests.

3. Many people have scoffed at the threat of HDCP stopping them from watching their movies. Many studios have opted to simply not turn the flags on yet. Wait a few months; then they will turn on these mechanisms to full effect.

4. The statement that HD-DVD is less DRM laden than Blu-ray Disc is often taken out of context. The truth is, both formats implement more or less the same technologies to stop users in their tracks, but only BD adds virtual machine runtime code and physical watermarking to the software/hardware layer.

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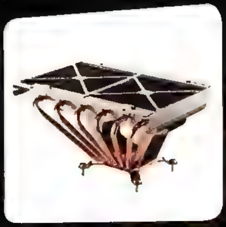
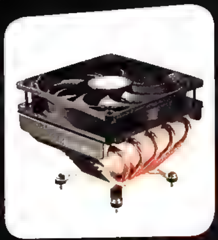

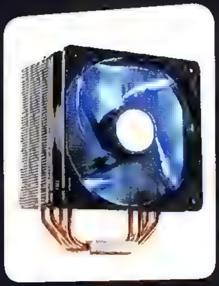

Geminii	Geminii S	CM Sphere	Hyper TX2	Hyper 212
175 x 124.6 x 81.5 mm	124 x 118.4 x 62 mm	132 x 132 x 113 mm	90 x 44 x 136.5mm	122 x 92 x 160 mm
Pure Copper Base	Pure Copper Base	Pure Copper Base	Pure Copper Base	Pure Copper Base
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0 dBA	17 dBA	22 dBA	22 dBA	19 dBA

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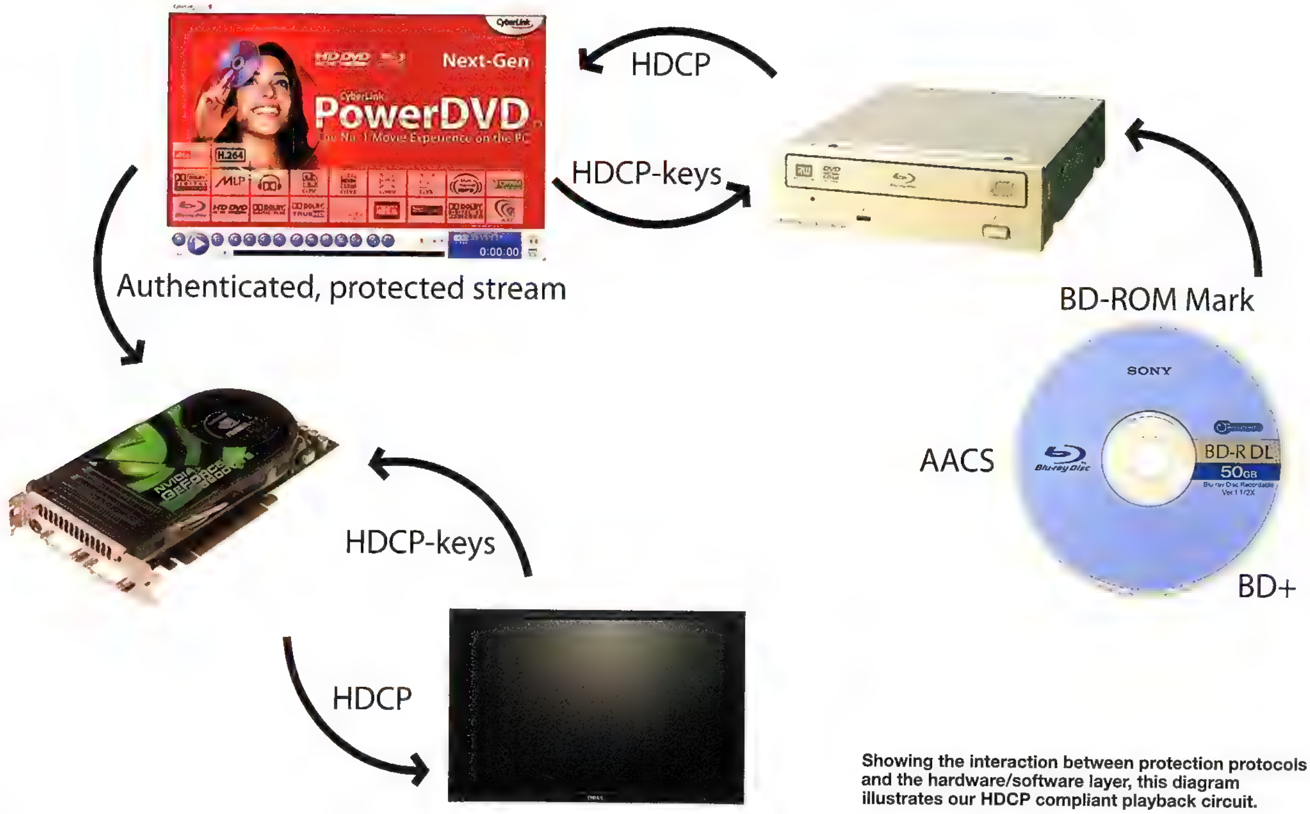


Showing the interaction between protection protocols and the hardware/software layer, this diagram illustrates our HDCP compliant playback circuit.

encrypted or human readable). Once all these pieces of the puzzle were in place, companies such as Slysoft implemented bypassing mechanisms in their software, AnyDVD HD. With such software, which is legally commercially available, one can circumvent ripping prevention mechanisms as well as alleviating the requisite HDCP supporting video hardware and display devices. This allows those of us without a new GPU or HDCP compliant LCD panel to watch Blu-ray/HD-DVD content on our computers.

In a final alarming insult to the content producers' efforts to secure their intellectual property, the BD-ROM mark technology was broken with the release of BDRGen in February 2007, thus (allegedly) allowing BD-ROM mark compliant media to be authored from a standard BD-R/RE device.

On the shelf

In the real world, we have set top players and PATA/SATA devices for our computers, for both Blu-ray Disc and HD-DVD. In Australia and the USA at least, Blu-ray Disc currently has a higher install base of set top devices, despite HD-DVD being cheaper to manufacture and purchase. Our industry analysis of this situation can be summed up as shots being fired over the ships bows. We don't feel the immediate actions of either format will clearly signal who has 'won' this war.

There are various news articles drifting all over the online media currently, making statements about studios and development houses siding with one format or the other. Ultimately, none of this really contributes to a clear 'winner' in the 'war' as yet; moreover, it clouds and confuses the situation with inconsistencies from a technical standpoint and half truths from the marketing perspective.

THE HARDWARE WHINGE

Sony's BWU-100A

Sony's BWU-100A PATA drive has proven popular for the company, introducing mainstream users to the 50GB dual layer storage medium. Sony's claim to fame is that it is the first company to introduce a BD-R DL (50GB) write capable OPU. Sony holds this exclusivity currently. With the clear advantage of being the only unit on the market that can write true BD-R DL, the BWU-100A and the SATA version of the newer BWU-200S are highly prized to those that require 50GB authoring capacity. At well over one hour for a dual layer write however, one has to consider the environment such a device will be used it, let alone the high cost of the BD-R DL media itself. The drive showed slow response time to spin up and a disappointing average data rate compared to the other two units in the round up.

Pioneer's BDR-202A

Pioneer's BDR-202A is currently the top selling Blu-ray disc recorder. Curious however, is that the BDR-202A is incapable of BD-R DL writing. At this stage, Pioneer only allows BD-R 25GB SL recording. The drive seems to be the most mature in the round up, having the advantage of being a third generation chipset and OPU, excelling in 4x BD-R writing, leaving the Sony unit in its dust. The drive has the most responsive spin up/init as well as having higher throughput metrics. For the media producer and the computing enthusiast, this drive is probably ideal, apart from the lack of DL support. Burn like you mean it.

LG's GGC-H20N

The GGC-H20N is a device capable of Blu-ray disc read, HD-DVD read and DVD/CD write. Is this the drive we've all been waiting for? With an inability to write either BD or HD-DVD media, the product is put in a different class. A distinct highlight of the device is the amazing BD DL extraction speed, blowing the Sony and Pioneer drives clean off the benchmarking table with an impressive DL extraction time (44.88GB) of 1 hour 56 minutes for BD and 2 hours 14 mins for the HD-DVD counterpart. One curious aspect of the performance in the GGC-H20N was the occasional HDCP link layer failure errors we received when trying to play back content. We suspect this is a firmware and SATA bus related issue that LG will potentially address in a later revision. If you don't care about recording, this might be the drive for you.

Drive model	Absolute Rip Time	Average Data Rate	Absolute write time	HDCP-link layer failure	Average CPU utilisation/rip	Average CPU utilisation/playback	Drive spinup/init
LG GGC-H20N	1 hour 56 mins (BD DL), 2 hours 14 mins (HD-DVD DL)	8297KB/sec	N/A	Yes	17 per cent	36 per cent	5.22 secs
Pioneer BDR-202A	2 hours 13 mins (BD DL)	7932KB/sec	23 mins 58 secs	No	7 per cent	41 per cent	2.71 secs
Sony BWU-100A	3 hours 17 mins (BD DL)	4130KB/sec	26 mins 40 secs (SL), 53 mins 12 secs (DL)	No	11 per cent	28 per cent	7.48 secs

There is an entire market for home and industrial computing to consider, which is only just coming to life.

So far, we have writeable Blu-ray disc drives and various iterations of combo units available, as well as some HD-DVD ROM drives (and again, various permutations of combo style drives). We don't have a valid HD-DVD-R drive on our market yet, however. For those who are concerned with industrial detail, a prototype Toshiba SD-L902A slimline notebook HD-DVD writer does exist; the drive was designed specifically for inclusion into the Toshiba Qosmio 40-11L series laptops. Unfortunately, initial testing by C't has confirmed high parity error responses output from the drive to Verbatim HD-DVD-R media. As a result, any media written in the drive is currently incapable of being used as a realistic playback medium in either a set top player or an Xbox 360.

Making things even more difficult for Toshiba as the global parent of HD-DVD is the vapourware release of the half-height PATA/SATA SD-H903A designed for standalone PCs. The world-first half-height PATA/SATA HD-DVD Recorder was announced at CES 2007. As of CES 2008, the product has still not shipped.

HD hardware

This month, we have devices from Pioneer, LG and Sony available to us for testing. Our testing scenario consists of a HDCP compliant environment utilising our nVidia GeForce 8800GTX and dual Dell 2407-FPW HC series panels. This is powered by an AMD x2 4600+ system. A simplified protocol/link layer can be found in Figure 3.0.

Our test content consisted of the *HellBoy* Blu-ray title and the BBC's *Planet Earth*, the complete series, for both HD-DVD and Blu-ray disc. As a result, we can gain a direct appreciation for the differences, if any, that exist between HD-DVD encodes and BD encodes. We tested the drives this month with a range of metrics including absolute write time, read back capability, ripping capability, burn compatibility and media decoding/HDCP link layer tests. We also used a subjective viewing test to try and ascertain if one format 'looked' better than the other.

Subjective testing: the colour and the shape

We used both formats in an attempt to directly compare the image quality of Blu-ray disc and HD-DVD. With our Dell 2407-WFP HC series panel calibrated to the standard hardware white point and no post processing in use on the GPU side, we used PowerDVD 7.3.x Ultra HD/BD edition with PureVideo HD enabled for GPU offloading. At first everything seemed identical. The features, disc navigation and functionality seemed very similar. After sitting for a while and taking screenshots at 1920 x 1200 however, we started to notice the same thing over and over. The HD-DVD transfer is always 'lighter' and appears more vibrant than the BD counterpart. The image just seems more lightly saturated. This isn't to say that the Blu-ray disc version of the film looks bad, but it does seem slightly darker side by side. This is echoed in direct comparisons of *Training Day* and *Kiss Kiss Bang Bang*. We conjecture that some kind of post processing functions have taken place in the studios that have created this light/dark difference with the formats. We anticipate that as time goes on, newer transfers will have less of a discrepancy between colour and contrast. Image quality was identical, with the same amount of colour graduation and artifacting in both versions of the film. Still, we cannot escape the conclusion BD seemed to have a less sensible contrast point, when compared directly to HD-DVD.

Let your ears do the talking

We'll be honest. These films hardly test the upper boundaries of high definition audio, nor do they make amazing use of surround environments – but they are indicative of the market at large. If we have any comment to make at all, it is that BD seemed to have a 'thicker' sound, whereas HD-DVD had a more airy, less standing-wave oriented sound. Neither of these qualities are bad or good, but they do reflect the differences in encoding schemas and enforced encoding methodologies.

The end game

We've seen what both formats are capable of in the real world. With the dust now settled from CES 2008 and HD-DVD's credibility damaged as a result of intentional movie studio disruption techniques, we find it hard to recommend the format as a reliable/dependable platform for your entertainment and storage purposes at this specific point in time. At no point will we make the claim that the HD-DVD format is dead, but we will offer the suggestion that it doesn't seem to be a safe option. Ultimately, with video quality so close between both formats and in some instances with the transfer quality ending up brighter on HD-DVD, we are left with three straight answers for the end user, enthusiast and general consumer to differentiate with:

1. Buy Blu-ray disc (Pioneer's BDR-202 or Sony's BWU-200S/100A) and be happy with your recording, storage and extensibility potential to come. You've gone with the popular format for the time being, with the studio and industry backing to justify the initial outlay. With Microsoft's statement at CES 2008 suggesting they will bend to the Blu-ray market and add a Blu-ray external drive to the Xbox 360 if the public demand it, it would seem that the vendors aren't sitting on their hands about this.

2. Buy HD-DVD and live in the now. You'll probably enjoy it all, for the cheap cost of players, but you may come to find you have no library of titles in a few months time as the companies drop support. Does it matter? That depends on your budget and willingness to shift formats down the track. Like it or not, the market trends, the price war, the availability of the titles on the video store shelf and the bad press have created a dark cloud over the format.

3. Buy a hybrid device such as the GGC-H20L. You won't be writing any media, but you'll have the flexibility of reading back both of the HD standards and in a sense, your investment is protected. This drive is the new 'king ripper' a-la the legendary JLMS-166S/H for optical aficionados. The closest competitor is Pioneer's BDC-202 combo drive, though that is a BD only

When our technology consuming society is still predominantly uneducated to this new medium and given that we are still in a state of flux, the actions the studios take right now will form the goal posts in two years' time. With market disruption tactics flying every which way and price wars being sparked as a result, there is no better time than now to jump into one of these formats. You'll be happy in the short term with HD-DVD and probably in the long term with Blu-ray disc.

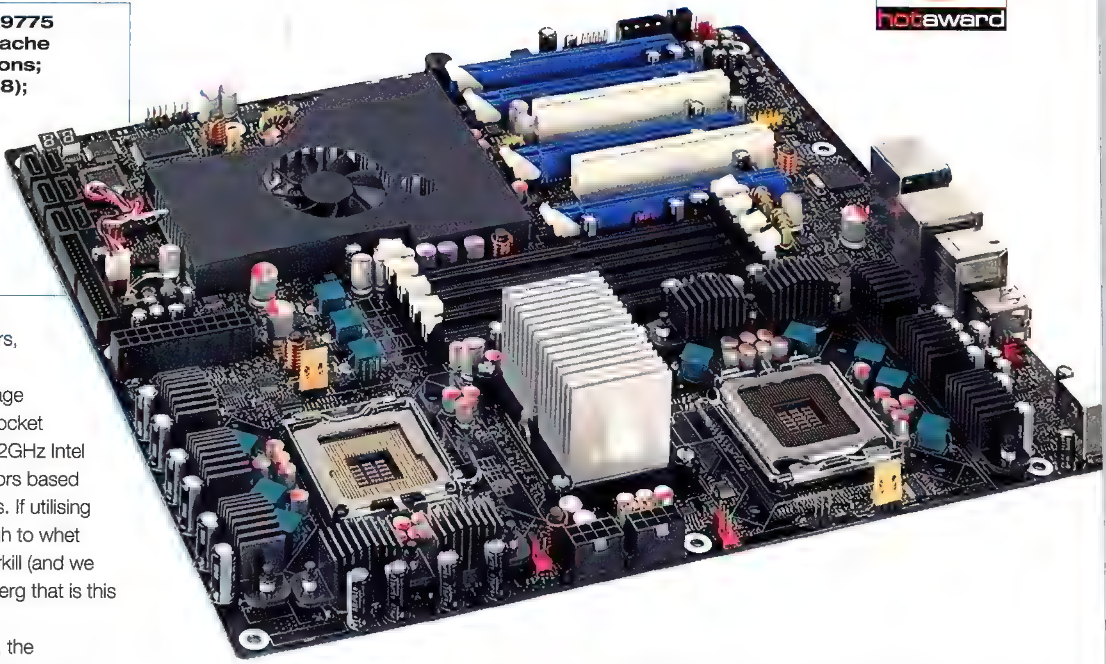
But the end game will be violet and 405nm in wavelength no matter what happens.

Skulltrail

Skulltrail or mouldy old bones? **Josh Collins** finds out whether Skulltrail will pwn or be pwned.

SPECS

Intel Core 2 Extreme QX9775 – socket 771; 12MB L2 cache (2x6MB); SSE4 instructions; 1600FSB; 3.2GHz (400x8); 45nm manufacturing process. Intel D5400XS 'Skulltrail' motherboard – 5400 chipset; nForce 100 SLI chip; dual socket; 1600FSB; WATX; Xx USB 2.0; 4x PCIe 16x;

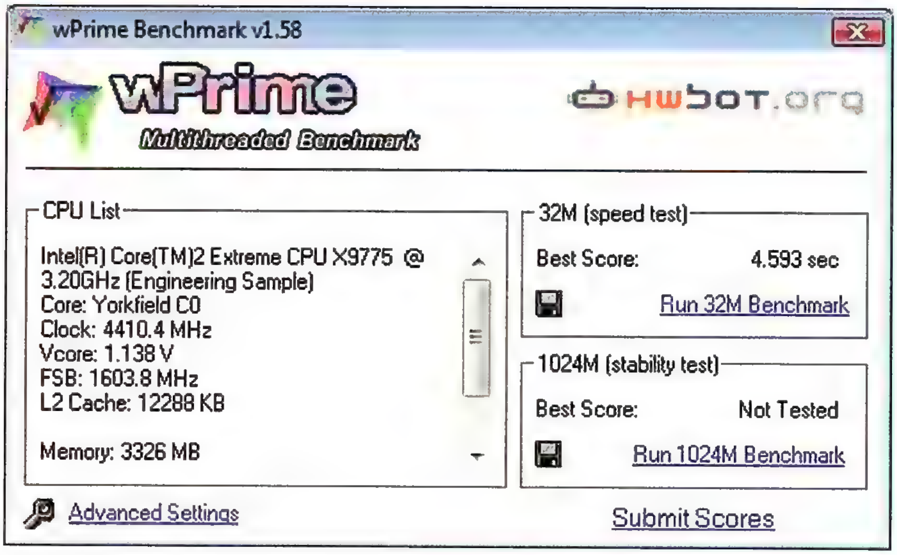


Packing two QX9775 processors, the socket 771 cousins of the socket 775 QX9770 reviewed on page ##, the Skulltrail platform is a dual socket enthusiast solution, featuring two 3.2GHz Intel Core 2 Extreme quad core processors based on the 45nm manufacturing process. If utilising a dual socket solution wasn't enough to whet your appetite, it's only the tip of overkill (and we mean that in such a good way) iceberg that is this insanely specced platform.

Following the dual socket design, the motherboard is based on the Workstation-ATX, or WATX, form factor to accommodate all the tech while still conforming to current, past and future case specifications. With two processors, four FB-DIMM slots, four PCIe 16x slots and additional PCI slots, it's no wonder the motherboard is so huge.

If we consider for a moment the second workstation-like feature on the motherboard you'll notice the memory used on this platform is FB-DIMM specification memory. This is an interesting but logical choice. With the inclusion of two sockets the processors need to, at times, access the same memory banks as one another, therefore order is needed when it comes to the memory addressing process. The FB-DIMM specification allows for this seamless communication and integration to take place. There are, however, a few down sides of utilising this specification.

One such down side is the sheer cost of the memory – for anyone who thinks DDR3 is expensive, you may wish to avoid looking up quality FB-DIMM memory prices. This cost, along with the asking price of two Core 2 Extreme processors and a motherboard as feature-packed and complicated as the D5400XS further rules this platform out as a piece of kit that will ever find its way into Joe Average's rig.



CPU List

Intel(R) Core(TM)2 Extreme CPU X9775 @ 3.20GHz (Engineering Sample)
Core: Yorkfield C0
Clock: 4410.4 MHz
Vcore: 1.138 V
FSB: 1603.8 MHz
L2 Cache: 12288 KB

Memory: 3326 MB

32M (speed test)

Best Score: 4.593 sec

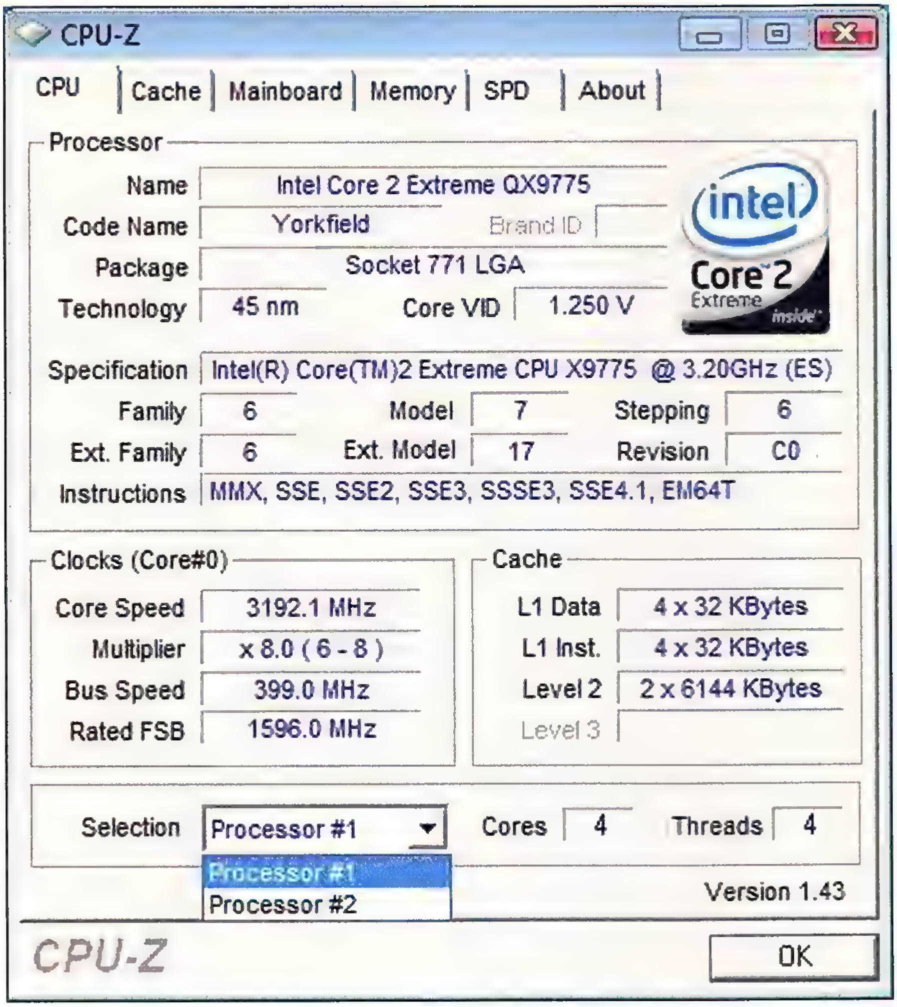
1024M (stability test)

Best Score: Not Tested

The FB-DIMM also brings with it a decrease in memory frequency and timings compared to enthusiast DDR2. The kit used to review this platform was a 2x 2GB engineering sample from Micron. An interesting fact to note is that the BIOS for the D5400XS under the memory settings had voltages for both DDR2 and DDR3 specification ICs and a side note specifying this fact. Unfortunately we were not able to clarify the IC type used on the engineering samples prior to going to print and as such we remained at or close to the stock specifications of 800MHz 5-5-5-15 2T. It was suspected the IC was a variety of the DDR2 Micron D9 series IC, however we felt it best to get Atomicans results and a review rather than blowing out the memory!

Just because we couldn't go nuts with the memory didn't mean we couldn't go nuts with the CPUs – mmm… that sounds cool, plural CPUs.

Using air cooling we found both the CPUs and the motherboard to be quite happy to play the overclocking game with us. Out of the gates we started off at the stock 3.2GHz to get our an idea of the performance we could expect. First and foremost – wow! When it comes to outright number crunching power there is no other enthusiast platform that can touch this system and we're only at stock frequencies so far. The sheer grunt of eight physical cores based on Intel's 45nm Core micro-architecture completes benchmarks such as wPrime and CineBench R10 with ease



Processor

Name: Intel Core 2 Extreme QX9775
Code Name: Yorkfield
Brand ID:
Package: Socket 771 LGA
Technology: 45 nm
Core VID: 1.250 V
Specification: Intel(R) Core(TM)2 Extreme CPU X9775 @ 3.20GHz (ES)
Family: 6
Model: 7
Stepping: 6
Ext. Family: 6
Ext. Model: 17
Revision: C0
Instructions: MMX, SSE, SSE2, SSE3, SSSE3, SSE4.1, EM64T

Clocks (Core#0)

Core Speed: 3192.1 MHz
Multiplier: x 8.0 (6 - 8)
Bus Speed: 399.0 MHz
Rated FSB: 1596.0 MHz

Cache

L1 Data: 4 x 32 KBytes
L1 Inst.: 4 x 32 KBytes
Level 2: 2 x 6144 KBytes
Level 3:

Selection: Processor #1
Processor #1
Processor #2
Cores: 4
Threads: 4
Version 1.43
CPU-Z

due to the applications' completely multi-threaded nature. It's no surprise then that when crunching single threaded applications it's as fast, if not a little slower, then it's socket 775 45nm dual core and quad core brethren.

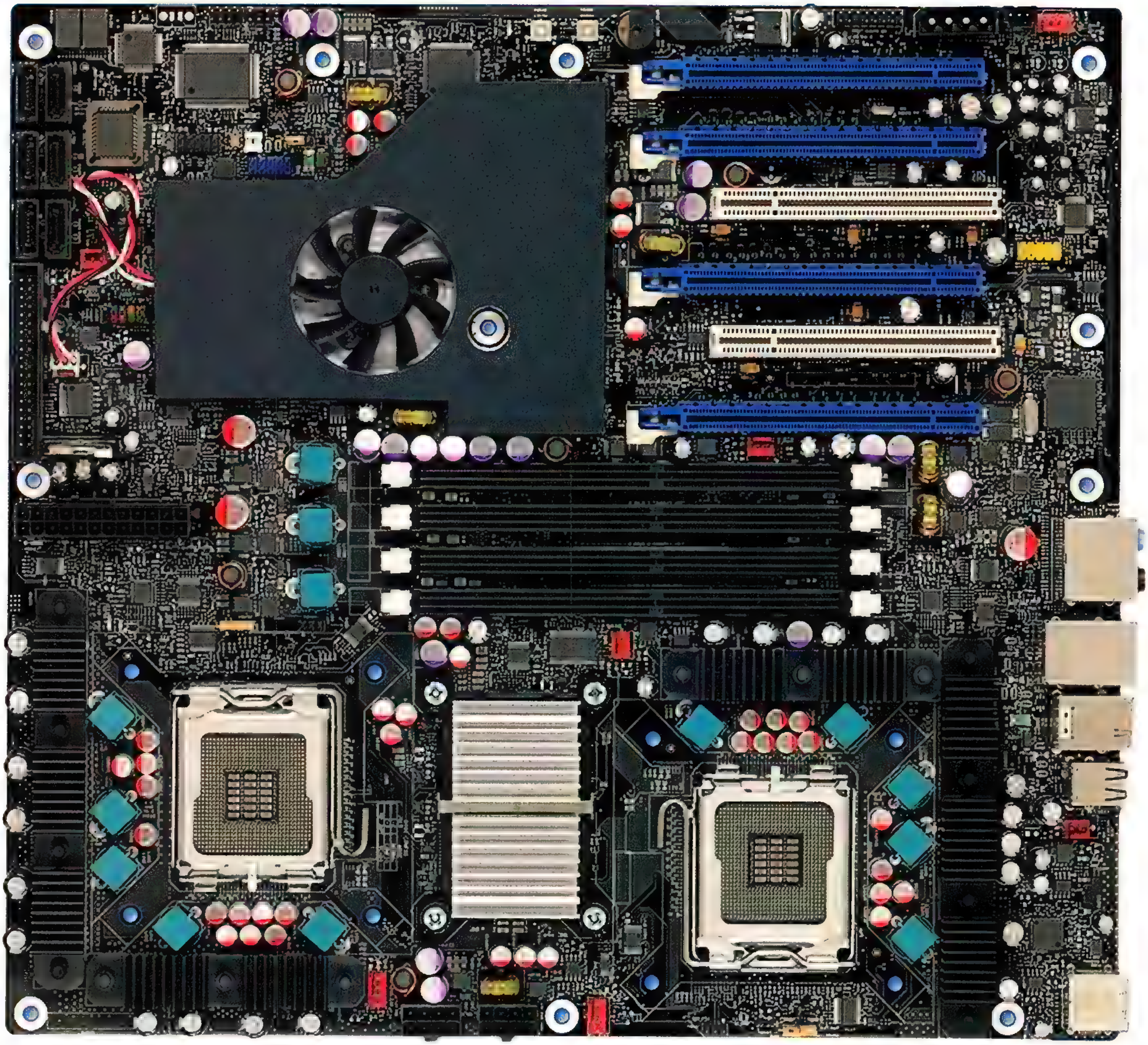
For those wondering why the single threaded applications are slower, if only ever so slightly, the reason for this is because of the FB-DIMM memory running at only 800MHz and with loose timings – relative to enthusiast DDR2 – of 5-5-5-15 2T. Without the memory throughput to feed the application to the processor, the system will run sub-standard compared to a similarly clocked socket 775 45nm dual core or quad core setup with enthusiast DDR2 memory and even more of a difference when comparing to a tweaked DDR3 platform – again, check out the review of the QX9770 and compare the results.

Like the 45nm socket 775 quad cores, the socket 771 QX9775 overclocks like a bat out of hell. Using just air cooling we managed to top out at an awe inspiring 4.4GHz on all eight cores. The amount of processing power this then handed to multi-threaded applications was amazing. At the time of printing, the Skulltrail platform tested in the Atomic labs was the second fastest outright at processing wPrime 32M on the HWBot database. Second only to a four processor, 16 core, AMD Opteron system – fear not, we do intend to go sub-zero but that chapter will have to wait for now.

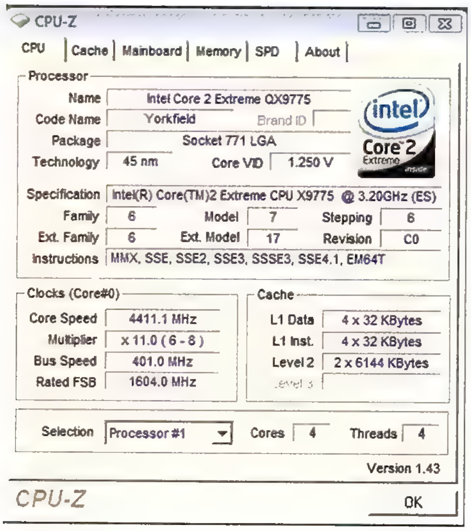
One area we've not yet touched upon and perhaps one of, if not the, most interesting parts of this platform and motherboard is the inclusion of SLI on an Intel chipset. This is achieved through integrating the NVIDIA nForce 100 SLI chip into the motherboard – unfortunately things aren't all ice cream and cherries. The nForce 100 SLI chip featured in the Skulltrail D5400XS motherboard

> “At the time of printing, the Skulltrail platform was the second fastest outright at processing wPrime on the HWbot data base.”

	400x8; FB-DIMM 800MHz 5-5-5-15 2T	400x9; FB-DIMM 800MHz 5-5-5-15 2T	400x10; FB-DIMM 800MHz 5-5-5-15 2T	420x10; FB-DIMM 840MHz 5-5-5-15 2T	401x11; FB-DIMM 800MHz 5-5-5-15 2T
Super Pi 4M	1m 29.156s	1m 21.937s	1m 16.297s	1m 12.438s	1m 11.484s
wPrime 32M	6.281s	5.687s	5.062s	4.812s	4.593s
3DMark06 CPU score	6375	6976	N/A	7971	8117
CineBench – single thread	3501	3932	4367	4594	4804
CineBench – multi-thread	20262	22655	24285	25226	N/A
Everest Read	3974MB/s	4009MB/s	4052MB/s	4249MB/s	4085MB/s
Everest Write	4603MB/s	4642MB/s	4557MB/s	4825MBs	4728MB/s
Everest Latency	90.2ns	88.7ns	88.2ns	83.2ns	86.8s



It really is a thing to behold, those two CPU slots. You almost think it's some kind of joke rig, like gluing a plastic ear to your forehead. But we're here to tell you this rig works – and works bloody well!



Processor
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L1 Data: 4 x 32 KBytes
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Level 2: 2 x 6144 KBytes
Level 3:

Selection: Processor #1
Cores: 4
Threads: 4

Version 1.43

is the same as found in the NVIDIA 680i SLI. This means in a 3-Way SLI configuration a maximum of 8x lanes per card are available. In the end, it's no surprise that NVIDIA kept the nForce 200 SLI chipset for the 780i SLI motherboards, thus securing the premium end of the 3-Way SLI market for itself, with 16x lanes per each of the three slots.

Not content with just SLI support on the motherboard, the Skulltrail platform also features CrossFire capability, with four slots available to potentially play host to CrossFire X... when the drivers are finally finished (who knows, by the time you read this they could be done!). Thanks to the Skulltrail platform provided being an Alpha sample, complete driver support for SLI and CrossFire – of all multi-card sorts – was still under development and undergoing final internal testing. There's no doubt we'll take a look at this when the opportunity becomes available.

At the end of the day, if you have a wad of cash you just must spend on pants loads of completely drool worthy hardware than you could do much worse than the Skulltrail platform. Keep an eye out as these systems become available from OEM partners as there's yet to be confirmation on standalone purchase potential.

Ludicrously fast, no doubt crazily expensive but my goodness, we certainly think it looks damn cool and runs bloody quick!

SCORE 9.0 OUT OF 10

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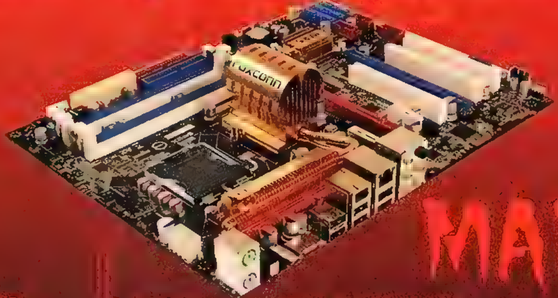

MARS

intel P35 Express Chipset

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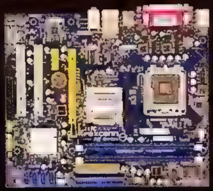
SPECIFICATION SUMMARY

- Supports Intel® Core™2 Quad and Core™2 Duo processors
- Intel® P35 with chipset overspeed protection removed
- Dual DDR2 1066Mhz Memory, max. 8Gb.
- 2* PCIe x16 with **ATI® CrossFire™** support
- **Gladiator BIOS** for advanced overclocking
- **100% SOLID Capacitor** design & **Cool Pipe** system
- Enthusiast features including **Onboard CMOS** & **OC Gear** profiles
- **AEGIS Panel** – Windows-based OC and monitoring utility

G31MX-K

- Supports Intel® Core™2 Quad, Core™2 Duo processors and Intel next generation 45 nm multi-core
- CPU with 1333(oc)/1066/800 MHz FSB
- Dual DDRII 800/667 x 2 DIMMs , max. 4GB.
- 1* PCIe x16, 1* PCIe x1, 2* PCI slots
- 4* SATAII , 8* USB 2.0
- Gigabit LAN , 5.1 channel HD Audio

intel G31 Express Chipset



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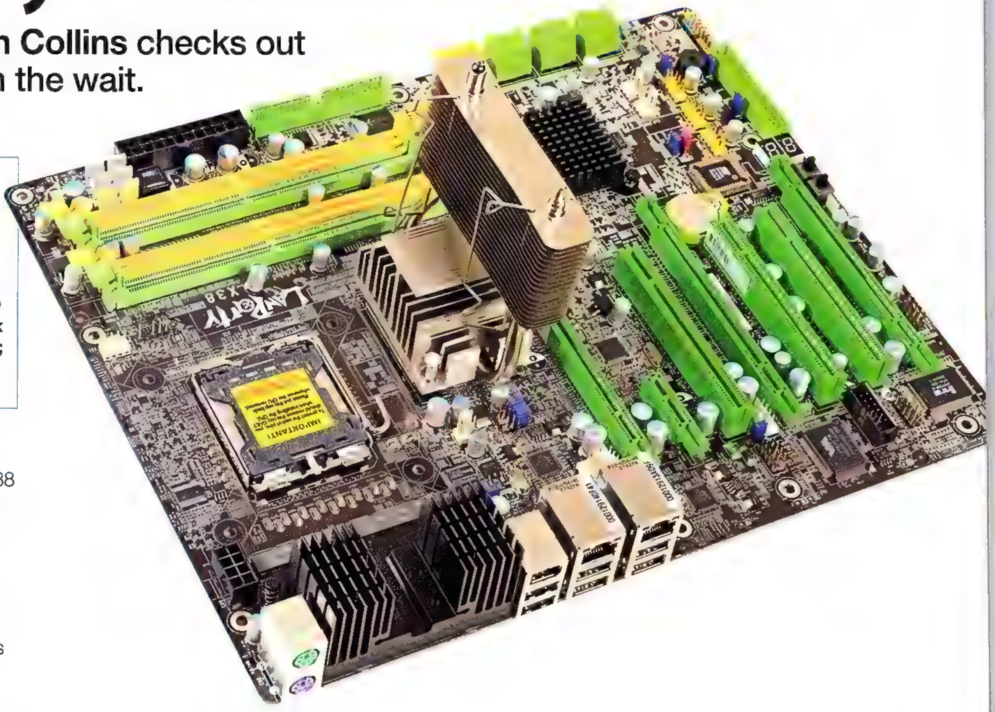
DFI LanParty LT X38-T2R

Better late than never, **Josh Collins** checks out whether this mobo is worth the wait.



SPECS

Price **TBA**
Supplier **BroNet**
Website **www.bronet.com.au**
Specifications **Socket 775; Intel X38 northbridge; ICH9R southbridge; ATX form factor; solid state capacitors; 3x PCIe 2.0 x16; 3x PCI; 1x PCIe x1; 1x EIDE; 8x SATA II; 1x FireWire; 1333MHz FSB; DDR2-1066; 6x USB 2.0 on rear I/O; 2x gigabit LAN**

Another board to add to the LANParty LT series, the X38-T2R brings to the table an X38 offering from DFI – albeit a little behind the pack.

Sporting many of the same features as its little brother, the P35-T2R, with components such as solid state capacitors, two gigabit Ethernet connections and support for 333MHz (1333MHz quad pumped) processors, the X38-T2R conforms further to its predecessor by even following the same component layout and expansion slot configuration – also featuring three PCIe 16x slots instead of two like most other X38 based boards. Additionally the placement of these PCIe 16x slots has been given a lot of thought and due to this allows for three cards utilising dual slot cooling solutions to be used with this motherboard.

The BIOS is the typical DFI LANParty series madness with enough settings to upset a Spartan. It is for this reason that the board could be considered a tweaker's delight, with hours of trial and error ahead for that ever so perfect system configuration… and a reason for others to run around in circles pulling their hair out. Depending on where you sit within that spectrum and how much time you spend in the BIOS tinkering, this fact alone could become a deal maker or a deal breaker.

It is certainly an interesting board and pulls on many of the features and strengths that stood strong in the P35-T2R that came before it. However, given the time it has taken to get to market and the lack of anything that is particularly new or additional to the P35-T2R with the exception of the X38 chipset, it's hard to help but to feel this board is 'just another board' and doesn't have any unique or outstanding features.

When compared clock for clock, the X38-T2R is faster than the P35-T2R – if only by a couple hundredths of a second here and one or two megabytes there, it is none the less faster. The P35-T2R was originally faster than the hordes of boards available from the likes of GIGABYTE, ASUS, Abit and MSI and this was mainly due to faster MCH (chipset) latencies. The problem now though is that the X38-T2R takes more effort to overclock compared to the P35-T2R and we can only suspect this is due to even further tightening of the MCH latencies; this was reflected within the results being that slight bit faster.

As a negative side effect of this, while maintaining the same parameters as tested on the P35-T2R and other motheboards based on P35 and X38 chipsets, the X38-T2R turned up some ordinary FSB headroom. Topping out at 540MHz FSB after scaling using SetFSB, the board could only manage to complete the full suite of benchmarks at the boot-in maximum FSB of 525MHz

During test we also discovered an apparent conflict between Everest Ultimate Edition 4.0 and the motherboard, effectively forcing a restart. This, we discovered, was a motherboard specific issue as the same image and install is used for testing of all the P35 and X38 boards. For this reason results for Everest read, write and latency are not included in the table.

Layout-wise the board is almost identical to the P35-T2R, with one minor yet strongly defining difference – the north bridge cooling solution. It is a well known fact among the enthusiast crowd that the X38 northbridge runs much hotter than the P35 northbridge and as such not only does it have its own IHS akin to a CPU's but also demands further attention in the cooling department. For this reason, the X38-T2R motherboard is packed with a separate northbridge cooling solution that the end user is to attach to the motherboard and northbridge. This type of solution is great to see within the enthusiast market and allows for those wishing to implement other third party cooling options to much easier attach these to the motherboard due to the sheer lack of a heat pipe jungle – thank you DFI!

The board is well built, well laid out and carries on from a successful predecessor. Unfortunately though, it does not build upon this solid foundation, more so appearing to just have a kick around and game on it instead. Here's hoping to a strong X48 offering, but we won't be holding our breaths after consistently delayed releases.

	333x9; DDR2-1000 4-4-4-10 2T	500x6; DDR2-1000 4-4-4-10 2T	525x6; DDR2-1051 4-4-4-10 2T	540x6; DDR2-1080 4-4-4-10 2T
Super Pi 4M	1m 30.953	1m 29.421s	1m 25.093s	1m 22.766s
wPrime 32M	29.749s	29.75s	28.297s	27.532s
3DMark06 CPU Score	2710	2716	2854	N/A
CineBench – single-thread	3069	3085	3240	3331
CineBench – multi-thread	5882	5902	6213	N/A

SCORE

7.0 OUT OF 10

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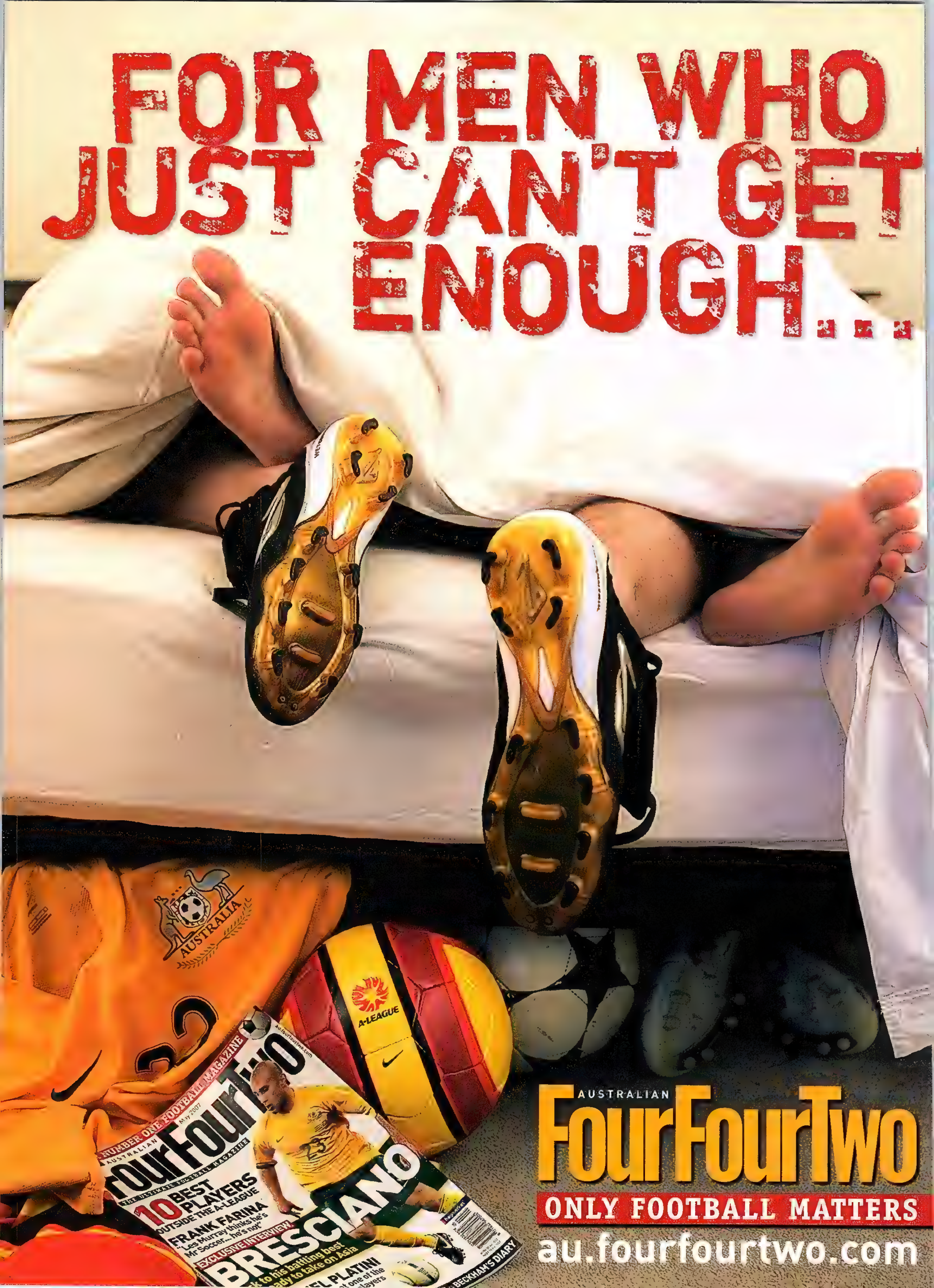
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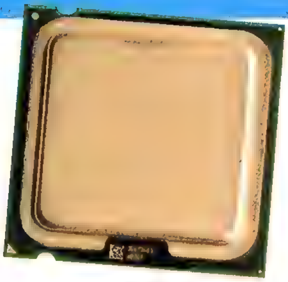
Intel Core 2 Extreme QX9770

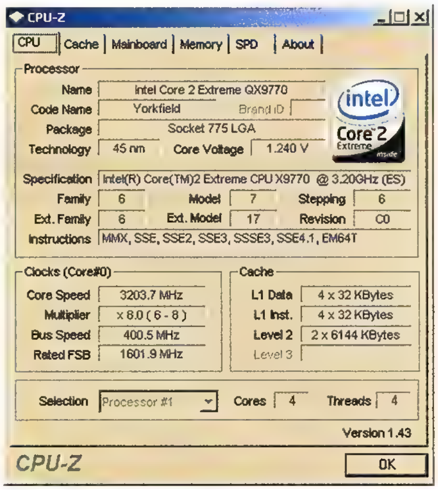


Just how extreme is Extreme? Josh Collins runs the numbers on Intel's latest.

SPECS
Price **$TBA**
Supplier **Intel**
Website **www.intel.com**
Specifications **45nm manufacturing process; high-K metal gate technology; 3.2GHz (400x8); 12MB L2 cache (2x6MB); SSE4 instructions; 820 million transistors; 214mm2 die size; 1600FSB**

In issue 83 we took a look at the then recently released QX9650. It's only a couple months later and we have another 45nm quad core processor to add to the Core 2 Extreme product range in the form of the QX9770.

Now while most individuals have been awaiting the non-extreme edition 9000 series 45nm quads from Intel, this release still sparks interest. The reason for this is the move to a 1600MHz (400MHz quad pumped) Front Side Bus (FSB). This increase in FSB means greater bandwidth, but all enthusiasts and overclockers already knew this and many of us have had our older 266MHz chips running happily at 400MHz and higher. The difference here is that the new QX9770 comes with a 400MHz FSB as stock– it could be said that the progression from 266MHz to 333MHz and then now on to 400MHz is more of a recognition of the frequencies enthusiasts have been playing around with for some time.



CPU-Z

Processor
Name: Intel Core 2 Extreme QX9770
Code Name: Yorkfield
Brand ID:
Package: Socket 775 LGA
Technology: 45 nm
Core Voltage: 1.240 V
Specification: Intel(R) Core(TM)2 Extreme CPU X9770 @ 3.20GHz (ES)
Family: 6
Model: 7
Stepping: 6
Ext. Family: 6
Ext. Model: 17
Revision: C0
Instructions: MMX, SSE, SSE2, SSE3, SSSE3, SSE4.1, EM64T

Clocks (Core#0)
Core Speed: 3203.7 MHz
Multiplier: x 8.0 (6 - 8)
Bus Speed: 400.5 MHz
Rated FSB: 1601.9 MHz

Cache
L1 Data: 4 x 32 KBytes
L1 Inst.: 4 x 32 KBytes
Level 2: 2 x 6144 KBytes
Level 3:

Selection: Processor #1
Cores: 4
Threads: 4

Version 1.43

Sitting well above the QX9650 in the binning process, the QX9770 selections would is the cherriest of the cherry-picked. To really test this theory, we decided we'd take to our victim, ahem… processor, with a Noctua NH-U12P air-cooled heatsink. A slight removal from our usual sub-zero antics of the latest and greatest processor but we've seen what can be done with the QX9650 45nm quad under sub-zero as recently as January with Atomic's own Josh Collins with Team.AU colleague James 'pro' Trevaskis benching two days in a row at frequencies between 5.2GHz and 5.4GHz at -110 degrees Celsius to -140 degrees Celsius. So the big question is what can the more mainstream expect from such a chip?

With the QX9770 strapped under this metal chunk of air cooling goodness we got to pushing the silicon. Once we got our bearings with the stock 400x8 configuration the next challenge was to achieve the same end frequency but using a 7x multiplier. This meant dropping the multi to seven (obviously) and then raising the FSB to 457MHz to compensate for the decrease in multiplier. We were happy to see the processor comfortably crunching away at the numbers as it sat nestled in an ASUS P5E3 Deluxe with a pair of Corsair Dominator DDR3-1800 C7 memory modules.

To find the maximum FSB we dropped the multiplier again to 6x and found the system would hang just above 475MHz, yet bench comfortably at 475MHz. With the difference between 475MHz and the previous 457MHz we raised the multiplier back up to seven. As a result, this also reigned in an end processor frequency of 3325MHz on all four cores.

Next we tested high CPU frequency clocks while maintaining a relatively high FSB frequency. This lead us to 450MHz FSB and a 9x multiplier with an end result of 4050MHz – not half bad for air cooling, and it let us achieve some pretty satisfying benching results. The system was running just shy of going sub one minute in the Super Pi 4M test and sub ten seconds for wPrime 32M; now was the time to seriously tweak.

After some BIOS tinkering with the FSB frequency and CPU multiplier, as well as the memory divider/frequency and latencies it was time to test again. At a whopping 4.3GHz on air cooling the chip simply flew through the benchmark suite. As well as doing the suite with ease, the system just so happened to score below a minute in Super Pi 4M and less than ten seconds in wPrime 32M.

The CPU ended up topping out at a maximum of 4375MHz. We attempted to push even further using SetFSB but found ourselves at a wall, freezing at 4400MHz – we'll leave this and above until sub-zero time occurs.

As mentioned the testing of this processor was done on the ASUS P5E3 Deluxe motherboard. The CPU was originally destined to be tested on the GIGABYTE GA-X48T-DQ6, however we found the BIOS was not yet fully capable of taking advantage of the QX9770, all the while operating fine with the QX9650. Be sure to keep this in mind if looking to purchase one of these chips. Additionally be mindful that the product development cycle can, and often does for the enthusiast, move into the live product cycle. The GIGABYTE GA-X38T-DQ6 had initial issues with the QX9650 but later grew to be a strong overclocking contender. Having tested on the F3d and F4d BIOS for the GA-X48T-DQ6 and seeing a lot of potential, we can only conclude that the board and the technology involved will come of age before it gets into the hands of the masses.

Cherry picked as the best of the best, these chips certainly deliver within the air cooling realm and we'll no doubt be seeing some respectively massive overclocks with the assistance of water cooling, phase cooling and the more extreme dry ice and liquid nitrogen cooling.

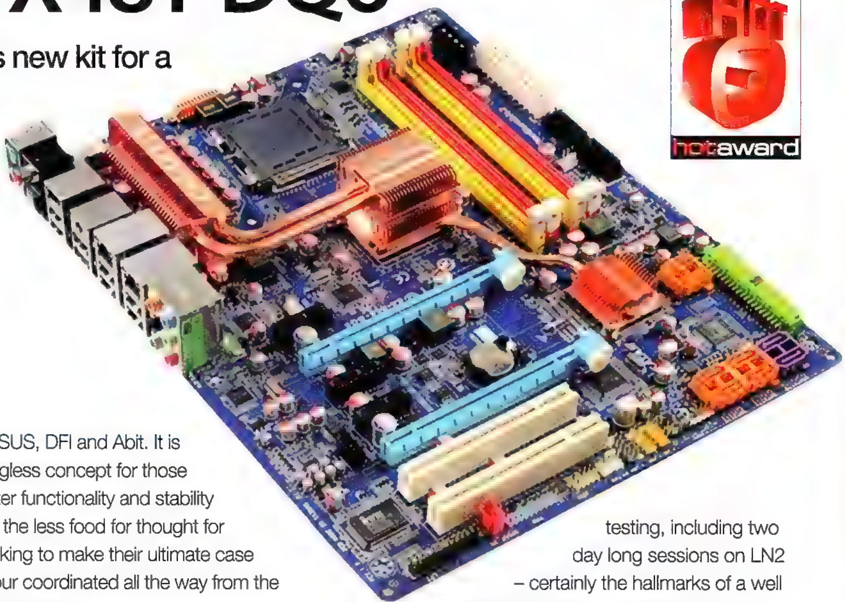
	400x8; DDR3-1600 6-6-6-18 1T	457x7; DDR3-1524 6-6-6-18 1T	475x7; DDR3-1585 6-6-6-18 1T	450x9; DDR3-1500 6-6-6-18 1T	453x9.5; DDR3-1814 7-7-7-20 1T
Super Pi 4M	1m 17.328s	1m 17.515s	1m 15.781s	1m 03.469s	0m 59.469s
wPrime 32M	13.297s	13.328s	12.828s	10.891s	9.546s
3DMark06 CPU score	5315	5362	5509	6590	N/A
CineBench – single thread	3541	3535	3674	4466	N/A
CineBench – multi-thread	12581	12611	13129	12239	N/A
Everest Read	10872MB/s	10867MB/s	11310MB/s	11135MB/s	12538MB/s
Everest Write	8535MB/s	9745MB/s	10133MB/s	9594MB/s	9660MB/s
Everest Latency	51.8s	52.5ns	50.1ns	51.1ns	45.1ns

GIGABYTE GA-X48T-DQ6

atomic hotaward

Josh Collins takes GIGABYTE and Intel's new kit for a spin around the block

SPECS
Price TBA
Supplier GIGABYTE
Website www.gigabyte.com.tw
Specifications Socket 775; Intel X48 northbridge; ICH9R southbridge; ATX form factor; solid state capacitors; 2x PCIe 2.0 x16; 2x PCI; 3x PCIe x1; 1x EIDE; 8x SATA II; 2x FireWire; 1600MHz FSB; DDR3-1900; 8x USB 2.0 on rear I/O; 1x eSATA; 2x gigabit LAN, Dynamic Energy Saver (DES)



The GIGABYTE GA-X48T-DQ6 feels like another chapter within a book. Very much reminiscent of the GA-X38T-DQ6 before it, as it was to the GA-P35T-DQ6. This board is the third generation and with subtle changes being made at each evolution, it's interesting to see what's on offer this time around.

Layout wise, not too much has changed. The board still features the same expansion slot layout, similar SATA port positioning, socket placement, memory placement and for the sub-zero guys, the socket outline for insulation is exactly the same. For the most part this is a good thing and simply banking on a known-good configuration. There are still, however, areas of concern for the layout when it comes to user friendliness and functionality.

The first such is the placement of the CMOS battery and CMOS clear jumper. These are placed in such a way that would make them difficult to access when utilising large dual slot cooled GPUs and near impossible if using additional expansion cards. Another niggling issue with the layout is the inability to effectively and easily remove the memory with a lengthy GPU, such as an 8800 series, in the primary PCI Express slot. This issue also means that in most cases – dependent on the IC and transistor placement on the back of the card – RAM coolers, such as the Dominator fan from Corsair, cannot be used due to obstruction from the GPU.

While we aren't too fussed by the colour schemes used on the GIGABYTE motherboards, these boards certainly don't have any claim to silicon sexiness like some of the similarly priced boards from the likes of ASUS, DFI and Abit. It is a meaningless concept for those simply after functionality and stability but none the less food for thought for those looking to make their ultimate case mod colour coordinated all the way from the silicon to the metal.

As the product name implies, the motherboard is based on the new Intel X48 Express chipset with an X48 northbridge, though still utilising an ICH9R southbridge. Much like the move from P35 to X38, there's a new northbridge while maintaining the well worn ICH9R southbridge. The X48 chipset doesn't bring all that much to the table for the average user; which is exactly what many have been expecting. It does however; bring with it an ever so slight increase in overclocking capability. We found this to mainly manifest itself in the form of increased overall frequency and stability within memory overclocking as well as the ability to maintain higher frequencies for a given latency set.

A nagging issue with the GA-X38T-DQ6 was popping MOSFETs when running high volts and sub-zero cooling. Although an issue only experienced by some of the most hardcore it was none the less a big issue for the board's design. After discussions with top overclockers and internal R&D it appears that this problem has been rectified for the release of the GA-X38T-DQ6. We ran the motherboard under a number of cooling solutions including air, water, single stage, phase change, two stage cascade phase change, dry ice and even liquid nitrogen. Stability was maintained throughout testing, including two day long sessions on LN2 – certainly the hallmarks of a well developed board mixed with solid sub-zero preparation.

Throughout these sub-zero sessions we ran a number of frequencies, including a maximum overclock of 5.4GHz on an Intel Core 2 Extreme QX9650 processor – it was fast, to say the least.

Rounding out the experience was the introduction of GIGABYTE's Dynamic Energy Saver functionality; DES for short. Similar in concept to the Intel processor feature Speed Step, in conjunction with the lowering of the multiplier, DES kicks in to control the power management and functionality of the power supply to the CPU itself. The new feature manages and lowers the power supply to the socket by switching off phases within the circuitry. This, for example, could effectively reduce an eight-phase power circuit to a three-phase circuit while the system is idling and in minimal use of power draw – an interesting green option to save on end power draw from the wall.

To assure this function doesn't do funky things to your overclocking experience, the DES feature automatically shuts down during overclocking to assure consistent and stable power supply to the socket.

During testing we utilised a number of processors, mainly with the intention of using the QX9770; however, we found early BIOS issues with the chip running anything above stock specifications – a similar issue was had with the GA-X38T-DQ6 upon the initial release of the QX9650.

All in all the first X48-based board to hit the Atomic labs has left a favourable impression. That said, if you're already sporting an X38 platform there's not much to gain from the X48 experience by comparison.

	400x8; DDR3-1333 5-5-5-15 1T (QX9770)	333x9; DDR3-1333 5-5-5-15 1T (QX6850)	450x7; DDR3-1800 8-8-8-24 1T
Super Pi 4M	1m 18.546s	1m 33.422s	1m 29.141s
wPrime 32M	13.296s	15.578s	14.718s
3DMark06 CPU Score	5328	4650	4889
CineBench – single thread	3534	2980	3145
CineBench – multi-thread	12600	10430	11060
Everest Read	9858MB/s	8908MB/s	9805MB/s
Everest Write	8493MB/s	6045MB/s	8159MB/s
Everest Latency	55.1ns	57.2ns	55.9

SCORE 9.0 OUT OF 10

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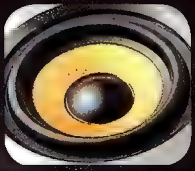
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Big Willy in action

David Field is still cackling maniacally, and half of North Sydney is still in darkness.

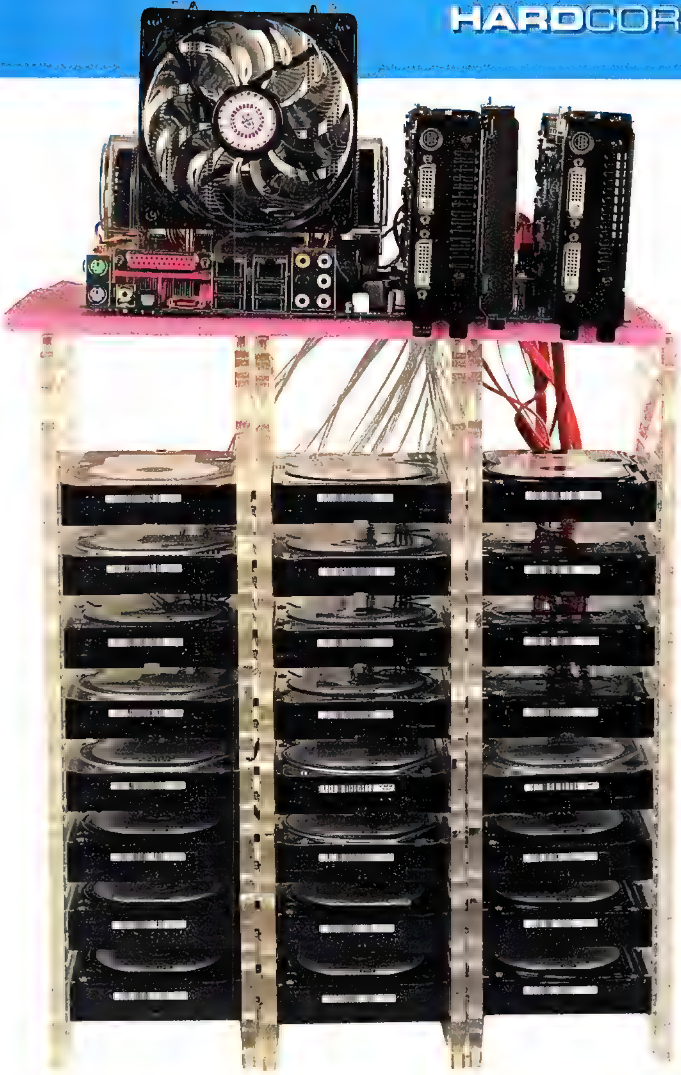
So what is it?

We've built the biggest single computer we could to see what happens to beefy power supplies when they are faced with a legitimately massive power draw.

Big Willy is 16 500GB Western Digital hard drives driven by an Adaptec 31605 SAS controller card and a further eight Raptors controlled by the Asus L1N64-SLI motherboard, which is home to two dual core FX-72 processors, 4GB of RAM, an 8800GTX and an 8800GTS.

Unfortunately, thanks to a slightly flaky engineering sample motherboard, we couldn't get SLI working. But the motherboard does let us use two processors, and their excessive power draw compensates for the lack of SLI: especially when you consider that traditional SMP processing has been sidelined in favor of dual and quad cores on a single processor.

By the time we were done, there were no more motherboard connections. We couldn't connect anything else to one computer, so we're considering this the ultimate power requirement saturation point. Run HD Tach, 3D Mark 06 and Orthos SuperPi simultaneously, and you have to ask the PSUs on the market today one question: can you power Big Willy? Well can you, punk?



Corsair TX-750 $215

BIG
WILLY
CERTIFIED

Those of you who remember the 770W Hiper Type R spinning up a paltry 16 drives last month may be assuming that the lower sticker wattage-ed 750-watt Corsair would suffer a similar fate.

But unlike the Hiper – which was evidently powered by croissants, cheese and wine -- the Corsair 750 didn't surrender. In fact, once connected to Big Willy and asked to power the ridiculous thing, it managed to get all 24 hard drives spinning up and POST first time.

The machine booted into Windows without any hassles and when asked to run our benchmarks did so on the first attempt, without a sweat. Had the unit been sweating in the literal sense, we wouldn't have noticed, thanks to its 8cm fan spinning faster than anything we'd ever seen in a PSU. Usually it's almost silent, but under intense load it's a screamer.

We can safely conclude that this power supply runs on miracles instead of electricity. For a more accurate conclusion, we point to its single and epic 12 volt rail (rated at 60 amps) and say it's made of sterner stuff than models that use multiple rails.

This is the George Gregan of the power supply world. Small, perhaps; but pulls more than its own weight in the power department.

SPECS
12V1 - 60A

Zalman ZM850-HP $249

BIG
WILLY
CERTIFIED

Ever since its entry to the cooling scene with its bizarre (and awesome) peacock heatsink for the Socket A Athlon many years ago, Zalman has insisted on doing performance in an over-engineered way. Which is great, and we love 'em for it.

But first; the important stuff. It passed the Big Willy test with no problems. There was no staggering the power of the drives during boot to reduce initial load, no problems booting or running the benchmarks.

And now; Zalman's engineering. Heat pipes are used to shunt heat away from the power supply's components to behind the exhaust grille. As a result, the fan speed is nice and slow in normal use, and not as loud as you'd expect while powering Big Willy.

Sure, the PSU uses multiple rails, but there's enough headroom here to run stupidly powerful systems without worrying about it its relatively inferior power delivery and by extension any power related computing problems.

In practice, its braided, modular power leads are a pleasure to work with, and the fan is quieter than most other PSUs across all loads. And it survived Big Willy. We should print that out on T-shirts and give them out to the power supplies that pass the test. No wait, that's a terrible thing to print on a shirt. Who thinks up this crap?

SPECS	
12V1 - 18	12V4 - 20
12V2 - 18	12V5 - 18
12V3 - 20	12V6 - 18

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- Antec 120mm Tri Cool
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- 2GB OCZ SLI Certified Memory
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- 18x Pioneer SATA DVD+-RW
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Antec Sonata Plus 550

ANTEC SONATA PLUS 550

SPECS

Price $275
Supplier Altech Computers
Website www.altech.com.au
Specifications (W)206 x (H)425 x (D)463mm; 12kg net; SECC & brushed aluminium; ATX and smaller; 3x 5.25in bays, 1x 3.5in bay that can be converted into 5.25in bay, 4x 3.5in bays (3x if using suspension mechanism); black & silver with copper trim.

Antec makes a vast range of cases, from little home entertainment units all the way up to gaming powerhouses with enough fans to fill an auditorium. But it's not all about size and power – quiet operation is another computing exemplar, and the Sonata Plus 550 is a true champion of the cause.

Design-wise the case's finish is akin to that found on shiny red tool boxes, but in black. The finish marks up very easily (pity our poor photographer *–ed*) but it also wipes pretty clean. The front fascia features a brushed aluminium finish which is set off by a painted copper highlight. Copper's not the most inspiring colour at the best of times, and we do feel this cheapens the design a touch.

The internals, however, are top notch for a case this size – it's a nice and roomy design for a case this small, and even though there's not a lot of cross support, the solid metal construction makes for a very solid design. Rolled edges are prominent, and everything seems nice and accessible. The side panels use spring-mounted thumb screws of a comfy size, and swing easily away – this will be a good case for frequent upgraders.

The drive bay count is ample for all but the most storage-hungry of users. This is meant to be a superlatively quiet machine, and Antec's added a feature that we find quite interesting – if you sacrifice a bay, you can suspend three drives in elasticised cloth bands. This way, the drives make no solid contact with the case frame, cutting down on vibration and noise. Of course, and Antec is quick to point this out, it's not a great solution if you're moving your PC around a lot, but for a relatively static set-up it's a neat solution, and really helps the Sonata run quiet.

We're very curious, however, to see how that material might stand up to prolonged use in the relatively warm and hopefully dry environment of a PC case.

It also comes with a 550watt Antec power supply, with a variable speed, quiet-running fan. Speaking of fans, there's only one 120mm fan mounted in the case's rear, though there are mounting points for two more behind the case's front door. One or two more would be ideal, but the low count is in keeping with the quietly-quietly mission statement. **DH**

SCORE **7.0** OUT OF 10

Nexus Caterpillar Real Silent Case

NEXUS CATERPILLAR

SPECS

Price $145
Supplier PC Case Gear
Website www.pccasegear.com
Specifications (W) 197 x (H) 437 x (D) 529mm; 8.4kg net; aluminium & mesh; ATX and smaller; 3x 5.25in bays, 2x 3.5in bay; black.

Now here's a rare piece of truth in advertising. Nexus' stealthy-quiet offering this month might seem unprepossessing to look at, with its matte black aluminium exterior and almost cheap-looking mesh grill at the front, but if it's quiet computing you want, this case is the real deal.

The case has a tendency to rattle a bit, which is something we usually chalk up to poor design, and the plastic door to the IO ports and plastic handles on the sliding mesh door don't help much either. But the downward sliding door is actually a nice touch once you use it, and when you get used to the design it actually seems quaintly old school in its simplicity. Inside, though? That's some cool stuff.

The entire interior has been switched topsy turvy, so that you have to open the left-hand side of the case to get at your upside down motherboard; the PSU is on the case's bottom, with the PCI and similar slots up top. This provides excellent airflow, allowing the two front and rear rubber-mounted 120mm fans to push a lot of air with a minimum of fuss or noise.

The fans are nice and quiet in their own right, but to make sure that what little noise they – and your drives and other fans, etc – make is elegantly masked Nexus has fitted acoustic foam on the case's ceiling & bottom, side panels and behind the motherboard. It might pick up some wear and tear if you're removing or adding a lot of parts, but it really does make a difference, and allows for the lighter aluminium construction.

The case's actual layout and design is nothing inspiring, but it gets the job done, and all edges seem well finished to protect delicate fingers. This is a neat case that really grows on you – and at a great price. **DH**

SCORE **8.0** OUT OF 10

Alienware Area 51 ALX

Just how extreme is Extreme? **Josh Collins** runs the numbers on Intel's latest.

SPECS

Price **$8,150**
Supplier **Alienware**
Website **www.alienware.com.au**
Specifications **Intel® Core™ 2 Extreme QX6850; 4GB (4x 1GB) 800MHz Patriot DDR2 RAM; HD1 - 2x 160GB SATA 10,000rpm drives (RAID 0); HD2 - 500GB SATA 7,200; 2x 20X Dual-Layer DVD±RW (one with LightScribe); Dual 768MB NVIDIA GeForce 8800 Ultra (SLI); Windows Vista Ultimate; Creative Sound Blaster X-Fi XtremeGamer High Definition 7.1 Audio; Logitech G15 Gaming Keyboard; Logitech G5 Laser Gaming Mouse; a host of exclusive Alienware extras; the admiration of your peers.**

So, you're mouth is most likely still agape at the ransom-like sum sitting above these words. It is indeed a high price to pay. Think of what $8,000 can get you – a car, a couple of years' rent, a Saville Row wardrobe. Fuck, you could get guy killed for money like that.

But look up again, and just run through the components; have a look at the gloriously shiny and lit machine on this page. You do get an awful lot of cool for your money. But is that enough?

We've got to say, right up front, that even before we started testing Alienware's latest high end behemoth that we were impressed. It was a two-Atomican job just to get the thing out of its box, but once we sat it on a desk the thing just looked like it wanted to compute, to game, to eat a benchmark or three. Alienware case design is very much a question of personal taste, but you really have to see one in the flesh before you make a final judgement. The ALX case design, with a range of colours and light options on offer, makes you think of old roadsters at the same time as your thinking of sci-fi vistas.

And it's not just all outward flair; when you start taking off the side panels, which are of course tool-less and screwless, you begin to understand that Alienware takes its reputation – and the cost of the machine – very seriously. Each side panel seems as solid as a rock, is lined with sound dampening foam, and swings easily away to reveal an interior that is God-like in its build quality. We gaped. We pawed at the neat cabling, bundled every two inches with trimmed cable ties, like apes touching the monolith. We found a happy a place. Even with the water cooling rig included as standard, every cable was tied back, bundled, folded like origami or neatly dealt with in some other mystical manner. There's not a single component on the board you cannot easily reach. It's simply good construction that makes for easy use, excellent airflow and a sound ability to transport.

The individual componentry is all top notch, too. Quite aside from the NVIDIA cards running in SLI, the drives are all Seagate models, the RAM is the good Patriot gear, and the keyboard and mouse are some of Logitech's best work. Quite aside from what's in the case, we're still quietly impressed – the ALX comes remarkably well packed in stylish black foam, with neatly labelled driver and recovery disks, a clear and easy to read manual that would make Apple proud, and with bumf like a pen, a keychain and more. The odd thing is… it's not tacky. We really liked that keychain. Even the Alienware tech support is top notch.

Is there nothing this system cannot do?

Well, we thought we might have a little look at the machine's performance. With a machine like this, which spits on the term half measures, we thought we best go straight to the top – we hooked up 30in Dell monitor and then powered up 3DMark 2006. Beginning at a reasonable 1280 x 1024 and minimal anti-aliasing the ALX simply shrugged its shoulders and returned a respectable 16,412 3DMarks; pretty much on par with our expectations, and certainly nothing to sneeze at. The Dell XPS 720 desktop only scored 11,000 odd by comparison, but that's what running 'only' a single card will do to you.

But how far can it really go? At 2650 x 1200, and with 4x anti-aliasing the ALX achieved 10,852 3DMarks. It's a fair score for such a punishing spec. Crysis, a similarly punishing game by any means, simply chugged like a dying ox, however. But that's more of a driver issue, and once we upgraded the drivers performance improved vastly. Still, when all's said and done, Crysis only manages a hair above 20fps, which is on par with what a single GT can do. The G80 core is really showing its age.

We could test more, but we're not sure of the point. If you're buying a system like this, you're almost certainly a gamer, and you're almost certainly not interested in tweaking the system – if you were, you'd hand pick your own components and build your own machine. It's a lot of money to spend, we admit, but this is an investment akin to buying Ferrari; sure, you want the car for the performance, but what you're really buying is a brand and a certain cache of cool. With the Alienware Area 51 ALX, you actually get a measure of both. **DH**

SCORE **8.0** OUT OF 10

RAZER

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Function: noun
Pronunciation: /'lak-ə-səs 'mü-ta 'mü-ta/
a: The largest pit viper in the world
b: *Latin.* Bringer of silent death

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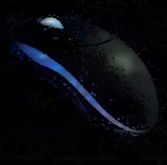

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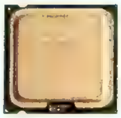
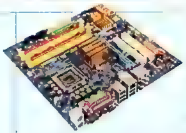
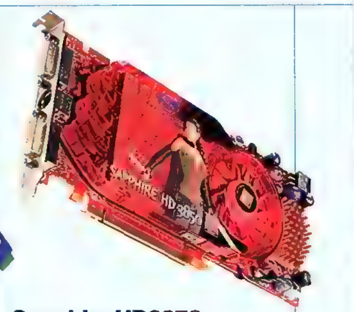
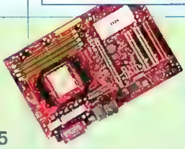
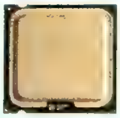
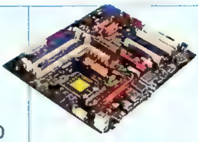
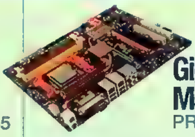
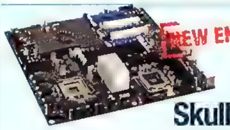
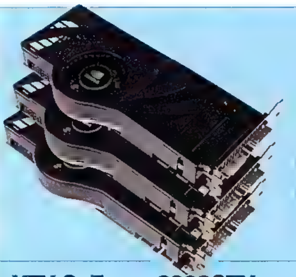
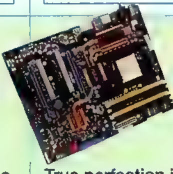
ATOMIC KITLOG

Our choice for the best gear the land has to offer

There's nothing sexier than new kit. And whether you need to horde your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of *Atomic* recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in *Atomic*, so if you want to learn more, look up the issue and page number listed.

		CPUs	Motherboards	Memory	Video cards
BUDGET *I can't afford to eat... gimme gear!*	intel	 **Intel Core 2 Duo** PRICE $100-$480 Stretch a little further and buy yourself a Core 2 Duo – you'll be thanking yourself later. The E4400 is the cheap ticket to speed, at $165.	 **GIGABYTE GA-G33M-DS2R** PRICE: $132 Using the G33 northbridge and has overclocking performance like its full ATX brethren, this Micro-ATX offering is extraordinarily hard to pass up. Reviewed in *Issue 81 – Page 52*	 **TEAM Xtreem Dark PC2-6400 C4** PRICE $95 Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits. Reviewed in *Issue 80 – Page 56*	 **Sapphire HD3850** PRICE $250 A great budget choice with some serious pixel-pushing chops, and an oustanding package of must-play games. Reviewed in *Issue 85 – Page 53*
	AMD	 **AMD Athlon 64 AM2 X2** PRICE $135-335 Cheap CPUs are a wonderful thing, and the X2s are now wonderfully cheap. The 3600+ is your budget baby at about $85.	 **MSI K9N Neo F** PRICE $113 Excellent performance from a budget board, with plenty of legacy slots for upgraders. Don't expect to overclock though. Reviewed in *Issue 68 – Page 33*		
PERFORMANCE *Hardware that bangs the best for buck.*	intel	 **Intel Core 2 Quad** PRICE $300-680 Core 2 Quad – a processing powerhouse, now affordable and overclockable like buggery. The Q6600 is the best buy, at about $336.	 **Foxconn P35 Mars** PRICE $236 A great board for the enthusiast with a mess of great ideas and good overclocking potential. Reviewed in *Issue 85 – Page 48*	 **TEAM Xtreem Dark PC2-6400 C4** PRICE $95 Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits. Reviewed in *Issue 80 – Page 56*	 **GeForce 8800GT 512MB** PRICE $390 We are stunned at the price performance ratio of all the GT-based cards, but none caught our attention like this solidly benching mo-fo. Reviewed in *Issue 84 – Page 36*
	AMD	 **AMD Athlon 64 AM2 X2** PRICE $135-335 The X2 series are still fantastic chips, and in the face of the Intel threat are now going for cheap. The 6000+ is your current sweet spot at about $235.	 **Gigabyte GA-M59SLI-S5** PRICE $250 Gigabyte delivers yet another affordable, feature-filled wonder of the 21st century. Reviewed in *Issue 66 – Page 39*		
EXTREME *Gimme power. Money is no object*	intel	NEW ENTRY **Intel Core 2 Extreme QX9770** PRICE $TBC The cream of the overclocking crop, based on the new Yorkfield architecture. Truly, Lord of the CPUs. Reviewed in *Issue 86 – Page 48*	NEW ENTRY  **Skulltrail** PRICE $TBA It's the craziest thing we've ever seen, and BY GOD we want three of them. Now. Reviewed in *Issue 86 – Page 42*	**FB Dimm Ram** PRICE $TBA NEW ENTRY We got to look at an engineering sample of this server-grade RAM, and oooh... very drool worthy.	
	AMD	 **AMD Athlon 64 FX-62** PRICE $1072 Sadly gets beaten by a mid range Core 2 Duo, but still the top of AMD's pile. Reviewed in *Issue 66 – Page 39*	 **ASUS M3A32-MVP Deluxe** PRICE $317 True perfection in a mobo form. Very well laid out and overclockable to boot. Reviewed in *Issue 85 – Page 51*	 **Corsair Dominator Twin2X 10,000** PRICE $1016 Crazy speed sticks that will also happily do 1T/800MHz/3-3-3-3. Comes with a fan attachment to keep things cool! Reviewed in *Issue 77 – Page 58*	**XFX GeForce 8800GTX Ultra XXX Edition SLI** PRICE $998x3 This is far and away the most powerful graphics card on the market, but be willing to sacrifice your entire retirement fund for the privilege of having one of these tearing up your screen. Reviewed in *Issue 78 – Page 59*

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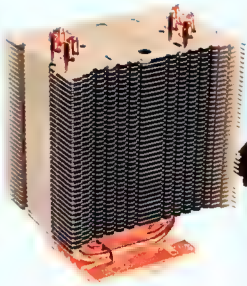
Coolers



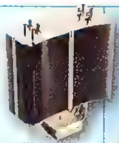
Noctua NH-U9F

PRICE $80

It may only be 90mm, but its cooling power is exemplary, coming in only slightly behind its 120mm brother.

Reviewed in *Issue 72 – Page 42*

Thermalright Ultra 120

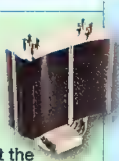


PRICE $75

Tower cooling that will keep your tower cool. Whack a Nexus 120mm fan on for near silent cooling.

Reviewed in *Issue 72 – Page 42*

Thermalright Ultra 120



PRICE $85

Make sure you get the optional AM2 bracket (hence the higher price). Grab that same Nexus fan.

Reviewed in *Issue 72 – Page 42*

Asetek Vapochill Lightspeed

PRICE $1020

Vapour phase change. Ooooh. Vapour. Phase. Change. No matter how many times you say it, it's still cool (pun!)

Reviewed in *Issue 64 – Page 38*

Cool-Trek Vostok

PRICE $199

Until more extreme cooling systems come along that are AM2 compatible, this little kit will have to fill the gap. Make sure you get the updated mounting kit.

Reviewed in *Issue 68 – Page 41*

System drives

Samsung HD160JJ 160GB

PRICE $68

Super quiet and yet still fast, the 160GB Samsung offers excellent value for money.

Reviewed in *Issue 69 – Page 40*

Seagate Barracuda 7200.10 320GB

PRICE $95

Seagate's fancy new technology makes this beast both fat and fast. Mmm, toasty.

Reviewed in *Issue 69 – Page 40*

Western Digital Raptor WD1500ADFD

PRICE $264x2

Dear lord. The performance king hath cometh, short of whacking in a SCSI. Buy two and RAID 'em.

Reviewed in *Issue 62 – Page 40*

Displays

Samsung 931C

PRICE $323

2ms of raging colour gamuts and beautifully smooth tonality that will make you weep with joy and hug strangers.

Reviewed in *Issue 70 – Page 56*

Samsung 244T

PRICE $999

Brilliance at 24", the 244T offers 6ms gaming, a wonderful gamut and more inputs than an alien hooker.

Reviewed in *Issue 69 – Page 48*

Hewlett Packard LP3065

PRICE $2109

Thirty inches, 2560 x 1600, 8ms G2G. If you can handle the size and cost to run this massive beauty, you won't be disappointed.

Reviewed in *Issue 76 – Page 53*

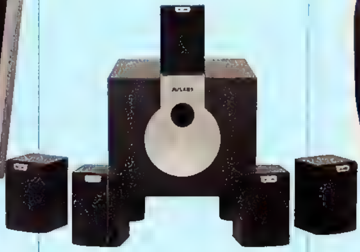
Speakers

Steelsound 5Hv2

PRICE $120

Awesome gaming audio performance on a shoestring budget. Phenomenal 'phones.

Reviewed in *Issue 73 – Page 43*

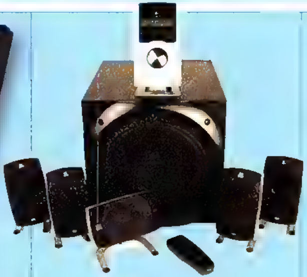


AVLabs AVL325

PRICE $165

While it can't hold a candle to the Z-5500D, with a price this low there's no excuse not to jump to 5.1.

Reviewed in *Issue 64 – Page 50*



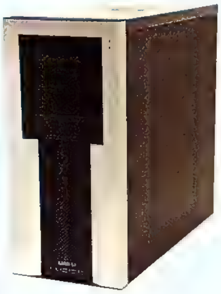
Logitech Z-5500D

PRICE $363

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike with equal impunity.

Reviewed in *Issue 48 – Page 56*

Cases



Lian Li PC-7S

PRICE $125

Quality, elegance, refinement and style. The trademarks of a Lian Li case, now available at an entry-level price.

Reviewed in *Issue 79 – Page 46*

Cooler Master Stacker 830

PRICE $285

Like the Stacker before it, this sensational Stacker stacks sumptuous specifications salaciously.

Reviewed in *Issue 61 – Page 36*

Silverstone TJ07

PRICE $348

The Silverstone Temjin TJ07 is a huge hulking beast that shows you mean business in the finest style. Impeccable finish and plenty of room means win.

Reviewed in *Issue 65 – Page 49*

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Oops, there goes a MOSFET

Josh Collins doesn't actually like breaking things - honest!

Non-Disclosure Agreements (NDAs) signed, doors closed and guarded, systems prepped and the inevitable first boot eagerly awaited. Then it happens, or rather, it doesn't happen. This is one of the lesser moments of being a tech writer and hardware tester.

I speak to many people, both online through the means of forums, IRC (yes, some of us still use it) and msn, as well as in person at special events, LANs and other wonderfully geeky gatherings. It is through these means that I frequently have people saying to me, often with a bit of jealousy and/or drool coming through at the same time, that I get to have all the fun and that my job must be quite easy.

It would be very hard not to agree with them that it's great fun; hell I'm practically in a hardware enthusiast's heaven, but this doesn't make it easy. When motherboards fail days before or even the night before deadline, when the latest and greatest CPUs go missing in transit or when GPUs miraculously end up at your competition's labs, it tends to make your otherwise joyous tech life a hassle.

> “Hardware failures... it is inevitably the price that must sometimes be paid for pushing the limits.”

As the ominous 'they' say, it's important to take the good with the bad and this is often not only a great lesson to learn for life in general but especially so when it comes to enthusiast hardware. It's very often that these pieces of hot kit are built with a very tight timeline and as such the first couple of weeks, even the first one or two months, can be a rather up and down time – ask any early adopter and they'll agree. But it's the joy of getting in amongst it all and being one of the first to either merrily float along the golden road of the information super highway or trudge begrudgingly through the bug ridden backtracks of being what could only be described as a retail paying beta tester.

Taking the good with the bad is also important when it comes to the realm of hardcore benchmarking. Truly addicted to testing the limits of hardware, I'll often hook up a bench session either solo or with other enthusiasts where we can bench multiple motherboards, GPUs and/or CPUs in a single session – all crazily sub-zero – and ultimately walk away from the session with nothing. Whether this nothing is a lack of (expected) results or quite literally nothing due to hardware failures, it is inevitably the price that must sometimes be paid for pushing the limits.

On the flipside, the rush, the good side of things when everything goes well, is a feeling that has to be experienced to be truly understood. That first time you see the temperature probe read sub-ambient temperatures, that first time you break a sub ten second pass in Super Pi 1M through to that precise moment that you send a system below -100 degrees Celsius for the first time.

These are generally rather extreme examples but the same rush can be gained by that very first overclock, be it a CPU, GPU, Memory or the FSB – it's that feeling of achievement that drives many of us to keep chipping away to the next level. At that precise moment you've conquered your system configuration, it no longer dictated to you the experience you were to receive from it. The hardware becomes truly interactive.

Interest in overclocking, what was once a dark art, is very quickly picking up within the greater enthusiast scene; not just with the hardware buffs but also the coders and gamers out there as well. It is this growth, development and synergy of influences that will ultimately push overclocking and hardware to ever higher levels.

And, sadly, more broken hardware and careworn sighs. But such is life.

We keep Josh on ice, and only let him out for benching
jcollins@atomicmpc.com.au

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8800GTS SPECIFICATIONS

Core Speed	650MHz
Memory Speed	1940MHz
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Memory Bus	256-Bit
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HDCP & HDTV	Yes
Output	Dual-link DVI

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TOMORROW'S TECHNOLOGIES - TODAY

Meet the new DRM, same as the old DRM

Take a step back in time to see the dismal future of media content control schemes...

If you wanted to watch recorded movies or record TV shows at home in the early '70s, things were grim.

Betamax VCRs came out in 1975 and VHS in 1976. In 1970, though, your only option was an open-reel, black and white 'Video Tape Recorder'. Nothing about those was any good.

In 1971, Sony's U-Matic system hit the market, with huge one hour cassettes and even huger VCRs, which didn't necessarily work at all with cheap TVs and which never made much of an impact on the consumer market.

In 1972, two more home cassette formats arrived.

The first, from Philips, was not horribly flawed. It had a dud name – 'Video Cassette Recording', or VCR. And it still wasn't cheap, and it wasn't very reliable, especially if you used the maximum duration one-hour cassettes.

But it was colour, and it pretty much worked.

The second 1972 cassette format was much more hilarious.

It was called Cartrivision, and it was produced by Cartridge Television Incorporated, a subsidiary of the company that owned the movie production and distribution outfit, Embassy Pictures.

You can see where this is going, can't you?

Technically, Cartrivision was quite adequate. It could record and play back colour – at only ten frames per second, but it looked less awful than you'd think. There was an optional tethered black and white video camera, which had lousy sensitivity and no sound unless you also bought the equally optional microphone – but which still gave instant results, which were a pretty big deal in those days of film home movie cameras. There was a timer record function. And pre-recorded tapes could even have stereo sound.

Pre-recorded tapes were, of course, the backbone of the home video revolution. It took a while for the movie companies to figure out that they were a good thing, and Embassy Pictures certainly weren't in the vanguard.

You could, you see, buy pre-recorded tapes for your Cartrivision system. But none of those tapes were movies.

You could get documentaries, sports, soft porn, and, according to the promotional material, "for the with-it set, the pulsing, driving, right-on sound of rock"!

> "... the 'content' companies still think unrewindable tapes sound pretty keen."

But if you wanted actual cinematic films, you could only rent them.

This, by itself, was not a disaster. Movie rental turned out to be a huge business, and Cartridge Television was the first to do it.

But because Embassy Pictures were in the movie business, they saw absolutely no reason to let people who rented a movie on Cartrivision watch it more than once.

So movies came on special tapes, which could not be rewound. Well, not without the special machine they kept back at Rental HQ.

You got to watch your movie exactly once, then you had to send it back, via UPS courier, since there wasn't exactly a Cartrivision joint on every corner. Then you could rent it again, if you liked.

Each rental, in inflation-adjusted dollars, cost at least as much as buying a new-release movie on DVD today.

Amazingly, a bit more than a year after launching Cartrivision, Cartridge Television went broke.

The un-rewindable movies definitely weren't the only reason why Cartrivision failed. You could only buy a Cartrivision VCR built into a combination TV unit that cost a third as much as a Chevrolet Corvette, for instance. And a warehouse full of tapes all died because of humidity. But the user-hostile rental policy absolutely did not help.

Now, here we are in the jetpacks and rayguns year of 2008 – but the 'content' companies apparently still think unrewindable Cartrivision rental tapes sound pretty keen.

'Single-play' movies and music seem to be irresistibly attractive to media companies, even though the idea has been tried over and over and over again, and failed as miserably as Cartrivision every single time.

But hey, it's only been thirty-six years. Perhaps it'll take 'em fifty to get the message.

If you've read this article, please burn this page.

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GAMEPLAY

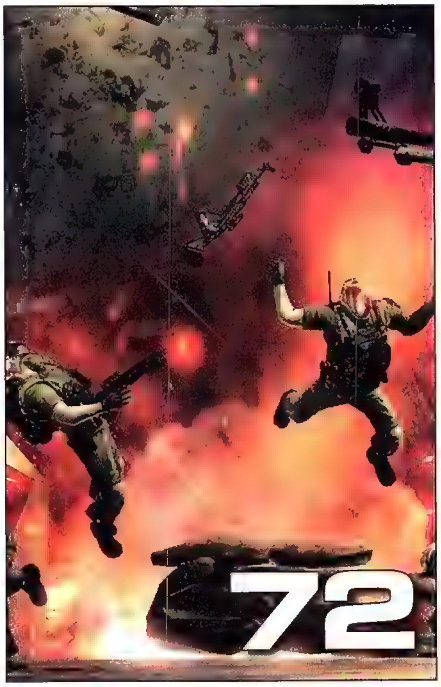
GAMES, GAMING AND GAMERS COVERED ATOMIC-STYLE

This is a tough time of year to be a gamer. On the one hand, there's so much great stuff just over the horizon, and on the other, you're still feeling hungover from the glut of big games released at the end of last year. But right now, it's toughest because there's a real dearth of good games.

But we managed to pack the section out anyway!

It's quite a forward looking round up, too, with lots of sneak peeks, previews and early looks. *Frontlines: Fuels of War* is looking a top contender to take down the *Battlefield* series, and we get all nostalgic with the PSP and copies of *WipEout Pulse* and *Warhammer 40,000: Squad Command.*

It's not rifles and bolter rounds, however, as we get a bit of swordplay in with a sneak peak at *Age of Conan: Hyborian Adventures* from our time spent killing Picts at CES. Crom!



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Engine Room:

Civilization Revolutions 68

Fancy pushing round little Romans on your favourite console? So do we! And so does Logan Booker.

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Dawn of War: Soulstorm 79

Age of Conan 80

Culture Shock

No Country For Old Men 81

American Gangster 81

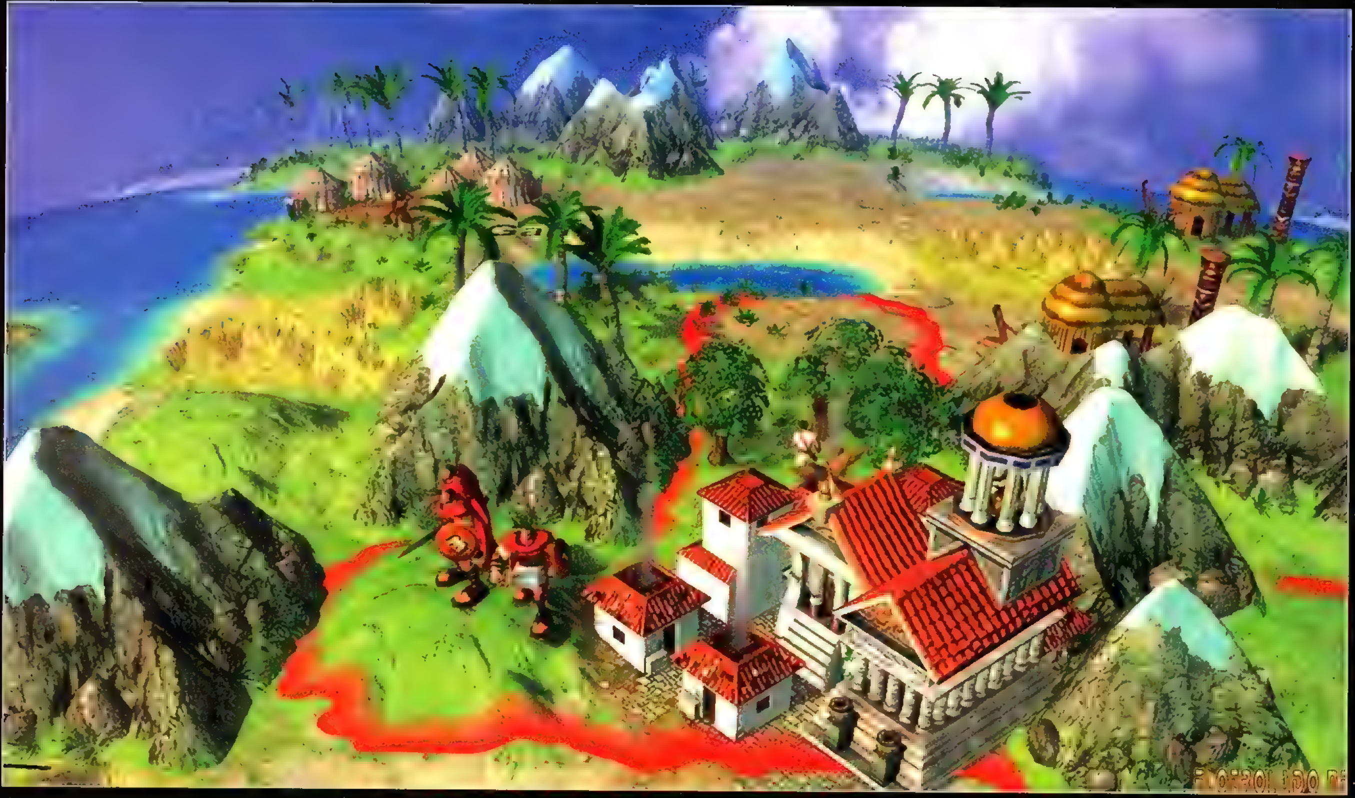
Geec Chic

Zara Baxter likes robots…

Win FIVE Kane & Lynch prize packs!

Atari and Atomic have five prizes for all you budding bank robbers and heist merchants out there. We have five packs consisting of a Kane & Lynch laptop bag and a PS3 version of the game itself, Kane & Lynch: Dead Men, to give away. You know the drill, people...

www.atomicmpc.com.au/competitions



Civilising the console

Logan Booker explores the brave new world of Sid Meier's *Civilization Revolution* with Firaxis' Barry Caudill.

Apparently, Civilization began in 1991.

Not *actual* civilisation, mind you. That would be silly. We know for a fact that the Romans would have a great deal to say on this assertion, if it were not for the fact that they're all dead. Good thing for history books, then.

Not that any of this matters seeing as we're talking about *Sid Meier's Civilization*. Some might remember it fondly as the first PC turn-based strategy game to rip through their psyches like an addictive narcotic, forever compelling them to play similar titles to soothe the savage, time-consuming beast within. Others would recognise it as a monster of the genre, a game that spat in the face of the looming threat of real-time strategy and said "Just a moment, we're not done yet, and oh, would you mind moving your car it's blocking my driveway."

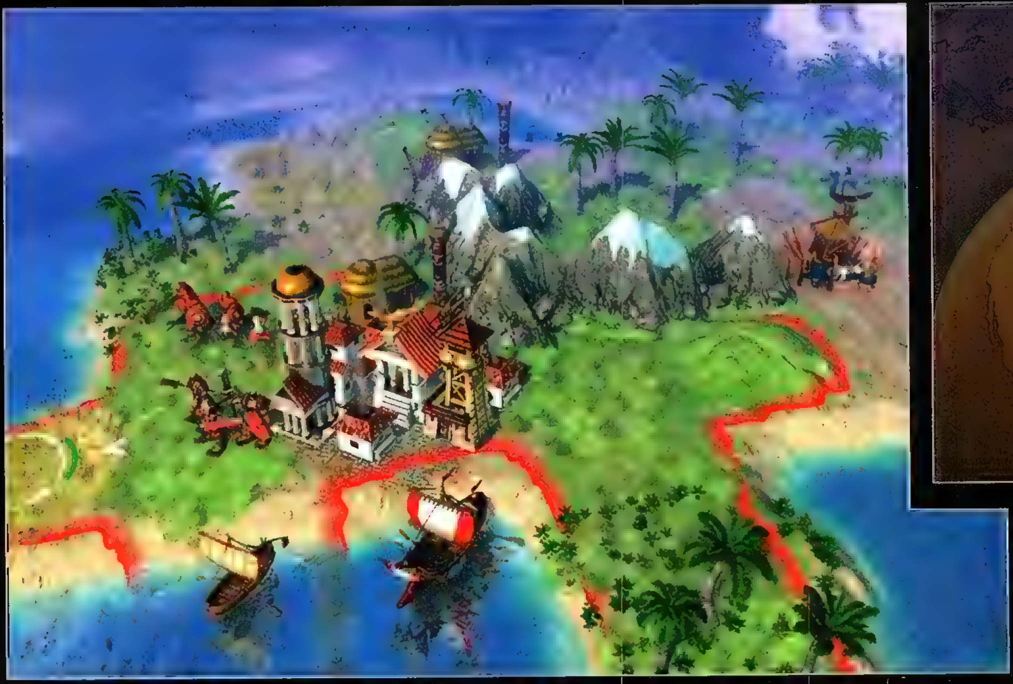
Despite this rebellious streak, RTS games have grown in popularity, so much so they're free to park their vehicles wherever the heck they please. Leave it then to Sid Meier to bring TBS back into the limelight with *Civilization Revolution* – and on consoles no less!

Yes, you read that right – *consoles*. Sid's new game will feature on the Xbox 360, Playstation 3 and Nintendo DS. So how long exactly has this fiendish plan been in progress?

"Sid Meier created the prototype for the game about three years ago and we've been working on it ever since," explains executive producer Barry Caudill at Firaxis Games, Meier's development studio.

It's scary to think that Firaxis has had the title under wraps since 2005. When you consider that the game won't be out for another few months, you realise just how serious the developer is about moulding the title into something playable on a platform void of a keyboard and mouse.

"The main reasons we decided to bring Civ to the consoles now is that the current generation of hardware allows us to really push the presentation of the game to a new level, and we think console gamers are ready for a new game experience," says Caudill.



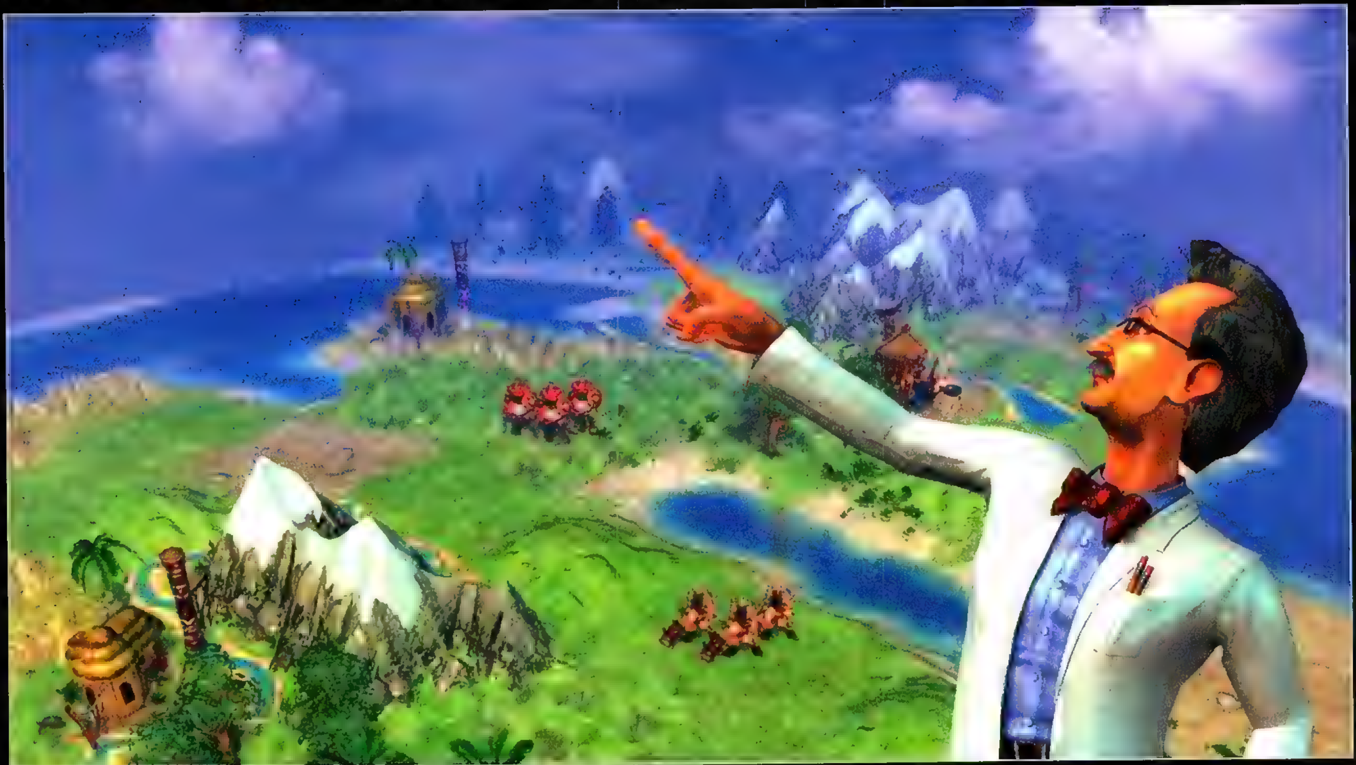
The new game definitely has a more cartoony feel, and along with the shorter games this should help draw in more casual console gamers.

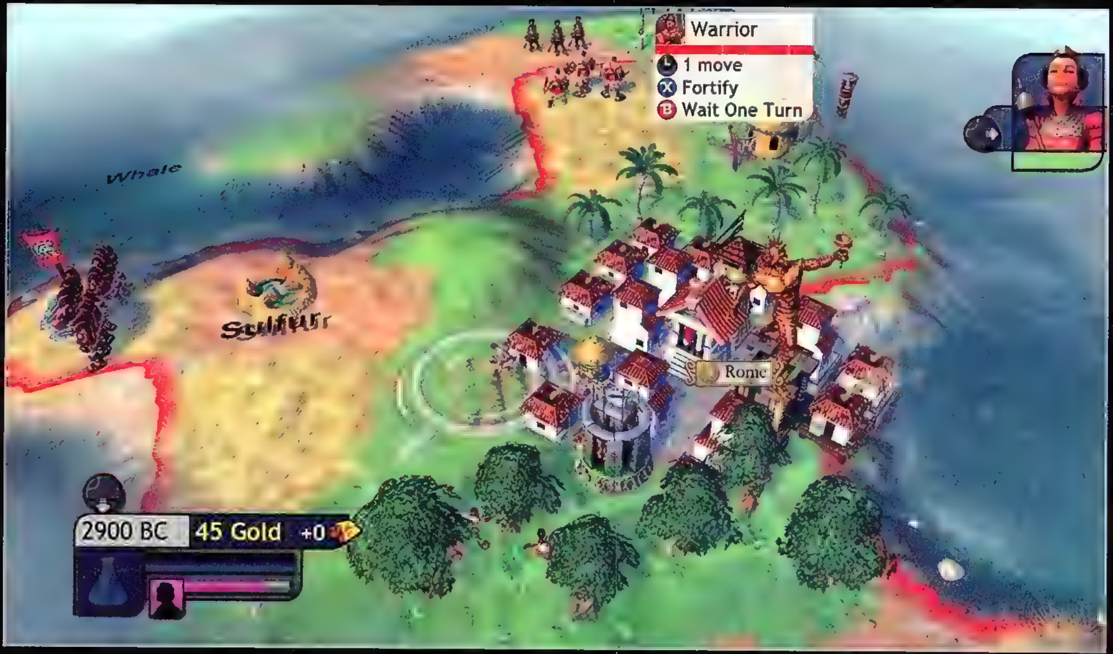
"The maps are beautiful with naturally eroded mountains and coastlines, the leaders and advisors are highly detailed and very interactive, we've brought the camera in close so players can experience the thrill of combat and the level of detail in units and buildings – it's really the best looking Civ game ever."

For Firaxis, the most important feature of the next-gen consoles is their large pools of RAM – the PS3 is equipped with 256MB while the Xbox 360 boasts a tasty 512MB. Late game AI can be very demanding on these resources, but both systems are up to the challenge.

If hardcore turn-based gamers still aren't convinced, then you'll be surprised to learn that *Civilization Revolution* marks the return of Sid Meier getting his hand dirty in actual development. Not since the original Civ has this been the case. Caudill says that Meier's not only been coding, but working with the artists, audio engineers and UI designers as well. If anything, *Civilization Revolution* may end up being the most complete and compelling Civ game ever.

"Bringing *Civilization* to the new generation of console and handheld gamers is a major step for the franchise and Firaxis, so Sid wanted to be the one to design and lead the effort," explains Caudill. "Civ is obviously very close to our hearts and we've been thinking about how best to create the experience on new platforms for a long time. We've taken a lot of time to design the game so that it works well on the consoles and DS. We just didn't want to leave that in anyone else's hands."





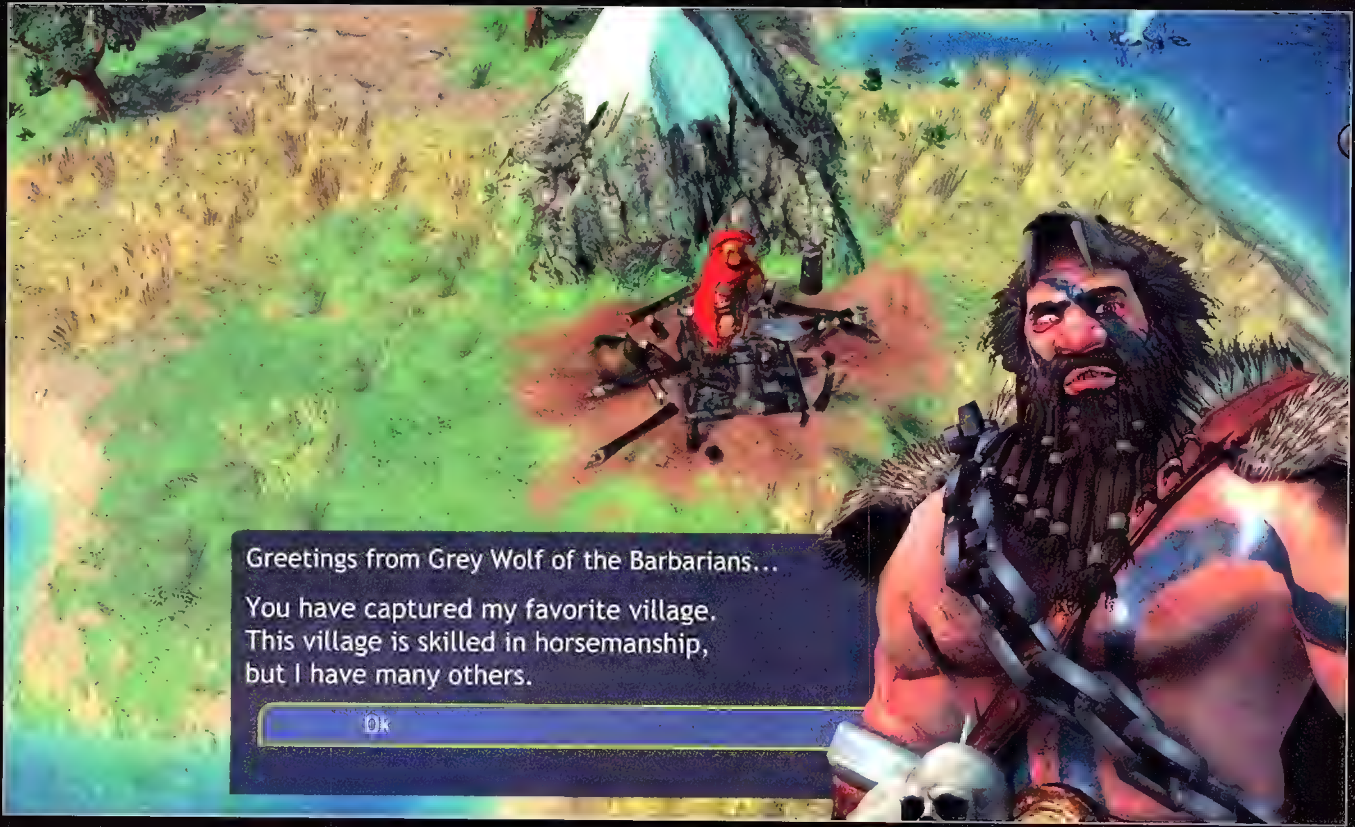
Conquering the UI

According to Caudill, *Revolution* is not based on any one game in the series – the team has drawn on all of the previous ventures for inspiration. Visually, it resembles *Civilization IV*, the most striking change being a slimmer, streamlined interface.

With the mouse and keyboard combo out of the picture, Firaxis had to carefully consider its options.

"Since *Civilization* is a turn-based game we don't have to sacrifice any of the depth – the game will wait for you to make your decisions," says Caudill. "In the process, we discovered that mapping the game to a controller was even easier than we thought it would be since the game has always controlled the player's choices, so there's never more than a couple choices at any given time. The depth comes from the way all of the individual decisions add up to create something epic."

Obviously, the UI is just one part of the bigger picture. An important one, yes, but comparable to the gameplay itself. Caudill already mentioned that much of the depth of the PC Civs has been retained in the new title, but there have been tweaks here and there to make it more accommodating of console gamers. For example, Firaxis has increased the speed at which the game progresses.


Greetings from Grey Wolf of the Barbarians...

You have captured my favorite village.
This village is skilled in horsemanship,
but I have many others.

"You have many others, aye? Well NOT FOR LONG, BARBARIAN SCUM!"

"Civ IV games can take multiple hours to complete, but games of *Civilization Revolution* will be finished in a few hours or less," states Caudill. "You'll still experience all of the goodness that is Civ and the whole sweep of time from the Stone Age to the Space Age, but you can complete a game in an evening."

According to Caudill, many of the changes have been made to draw in a broader audience, something that's bound to happen when a game that's been exclusive to one platform for almost two decades finds itself on multiple new ones. To this end, a lot of effort has gone into making the game more vibrant visually, mostly by zooming closer to the action by default and emphasising the style seen before in Civ IV.

"We approached the design of the game in such a way that we didn't have to leave anything behind; rather we took all of the things from the previous Civs that made them such fun games and brought them into the *Civilization Revolution* design and then built the game from that foundation," says Caudill.

Rev your engines

Like building a civilisation, the foundations for *Revolution* had to be placed first before Firaxis could even begin thinking about launching an assault on the console generation. To prepare, the developer enlisted the aid of Emergent Game Technology's Gamebryo middleware. If the name sounds familiar, it should - it's the same engine used by Bethesda for *Elder Scrolls IV: Oblivion* and the upcoming *Fallout 3*. Seeing just how glorious *Oblivion* was, it's not hard to argue that Gamebryo was a good choice.

"We've been using this engine since *Pirates!* and it just made sense to keep all of our previous efforts as we moved forward into the next generation," says Caudill. "We've built the gameplay engine from scratch. We have a very talented team of programmers working on the game and once we're finished we'll have a strong engine on which to build future games."

One of the advantages of Gamebryo is that it's designed to work on all platforms. That doesn't necessarily mean all platforms are created equally, however. Caudill admits that the developer has found the Xbox 360 more comfortable to work on, but he attributes this to the company's previous experience with the console while creating *Pirates!*.

"The PS3 has probably been the most challenging, since it's completely new to us and the DS seemed to just flow pretty naturally. It's been a great learning experience for our teams and we're excited to have this new depth of development knowledge as we move forward."

Go forth and prosper

Caudill says the development overall has gone quite smoothly, and if anything's held the team up, it's been building technology along the way. Even with a tweaked and personalised version of Gamebryo under the hood, Firaxis has had to work on three systems simultaneously.

"Our biggest challenge has been creating the technology as we're building the game, since this is all new territory for us. And building the game for three different platforms at the same time is a bit tricky. We've tackled the challenges head on quite successfully because we have a really talented group of people working on solving the problems as they arise," says Caudill.

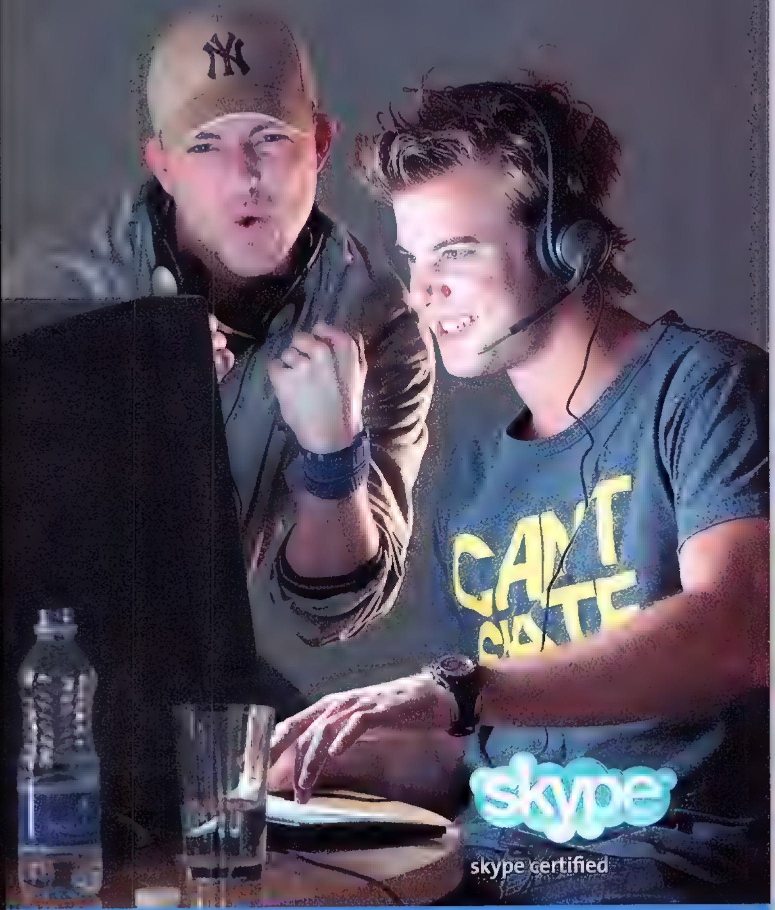
Although Caudill wasn't able to say much on the topic, he did confirm that *Civilization Revolution* will have downloadable content.

"We have a pretty robust plan for downloadable content that we'll reveal closer to the release of the game. Some of the content will be free and some will be paid."

Having played a preview build of the game on the 360, we can say it's coming along nicely. Firaxis has done an amazing job getting the UI to a state that's comfortable to use on console, and at no point did we feel overwhelmed. The performance wasn't quite up to scratch, especially when you try to zoom out, but optimisation always comes towards the end of development.

If we had to give a tentative verdict, we'd say keep your eyes peeled for *Civilization Revolution* in the coming months. No matter if you're a veteran of the series or a console gamer looking to delve into old school strategy.

SENNHEISER
COMMUNICATIONS



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Frontlines: Fuel of War

It's the end of the world as we know it, and David Hollingworth feels fine.

At first blush, newcomers to Frontlines: Fuel of War could be forgiven for thinking it a not too subtle clone of the Battlefield series of games. There's a similar spread of classes, a point-capture mechanic to move each individual game forward, and a familiar mix of vehicle-based and foot-slogging action. Even the dystopian near future wracked by resource shortages and constant combat could be a rip-off of Battlefield 2142.

But those newcomers would be wrong, as they quickly discover the subtle depth to Frontlines, along with a host of original flourishes and toys that sweep a refreshing broom (or should that be rake?) through the sandbox warfare genre.

The game's story is a simple one – vital resources, such as oil, are running out, and in 2024 it all goes to hell in a very big military handbook. Nations mobilise to secure areas of vital economic and energy/resource importance. The battlelines fall along roughly classic east/west lines, and players can choose to fight for the vaguely evil Red Star Alliance and the vaguely good Western Coalition. Thankfully, there's little jingoism as the game's single player storyline progresses; rather, there's a pervading sense that the world has simply gone wrong and that everyone is merely doing what it takes to survive.

The real meat and potatoes of the game, however, is in the multi-player – as it stands, the single player campaign uses the same maps anyway, and near identical mechanics, but simply populated with bots. The bots aren't bad, but it's still just a training prelude compared to the mayhem and promise of tactical depths once you log on to a server with either 32 (on the 360) or 64 players (on PC) all trying to push on their objectives.

You'll need that training, too, thanks to two big twists on the standard gameplay in this type of game.

First up is the class and equipment system, and the equipment itself. You get to choose between six classic weapon load-outs (Assault, Sniper, Spec Ops and so on) and four equipment loadouts; this means you can use the weapons you want, along with the toys you want, without having to compromise; no more having to put up with crappy weapons if you want to play an engineer, for instance. The 24 different combos really each play very differently, thanks to some very cool equipment.

The four equipment-based roles are Ground Support, EMP tech, Drone Tech, and Air Support. They pretty much do what they say on the box, letting you set up repair stations or weapons turrets, if you're a Ground Tech, or call in devastating air strikes if you choose Air Support. The kind of strikes or equipment you can employ upgrades as

you eliminate the enemy or take objectives.

However, easily the most interesting role is that of the Drone Tech. With this loadout you can deploy UAVs to scout out enemy positions, bomb cars to drive under tanks or into bunkers, or even armed UAVs to really keep enemy heads down. With all the different infantry weapons, a larger than usual array of vehicles to get carried away with, and the drones, Frontline's battlefields are amongst the most target heavy and chaotic that we have seen.

But the game's developer, Kaos Studios (who, incidentally, were the R&D team behind DICE's Battlefield games), has added a mechanic to reign that chaos in and keep the action tight and focused – and, oddly enough, that mechanic focuses on pushing your frontline forward.

Like the Battlefield games, Fuel of War's combat zones are split into objectives, but each objective forms part of a larger frontline. To push forward, you've got to take the entire line before other objectives open up. Each map tends to open up to about three objectives wide in the middle, and then narrow down to one final capture point. In practice, this effectively does away with the issue of simply not being able to defend all points at all times, and it makes the warfare seem more focused and intense.

At this stage we've only seen preview code, so graphically the game still leaves a little to be desired – there are some really great textures, but texture pop-in, especially on vehicles, is still highly evident. Similarly, there's some great physics in the game, but that's still being polished as well – some vehicles do exhibit some rather… problematic behaviour. Nothing game-stopping, but if all the niggles and issues can be worked out of the final product the Battlefield series might well be looking at a very popular competitor.

MISSION OBJECTIVES

bjective A: Secure ammo dump »

bjective B: Destroy missile battery »

bjective C: Sabotage tank factory »

bjective D: Download data from enemy computer »

PC

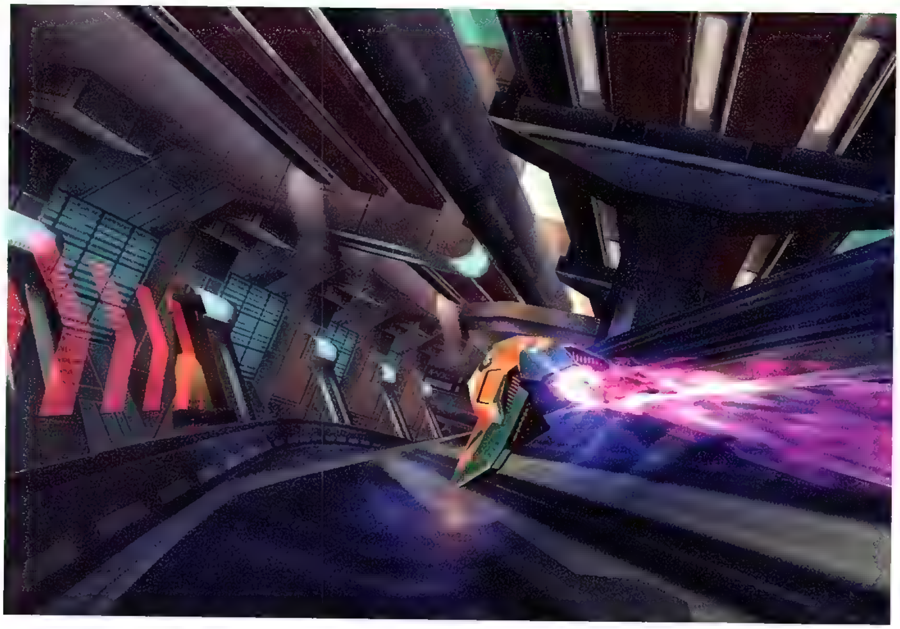
Developer **Kaos Studios**
Publisher **THQ**
Website **http://www.frontlinesgame.com/**
Other platforms

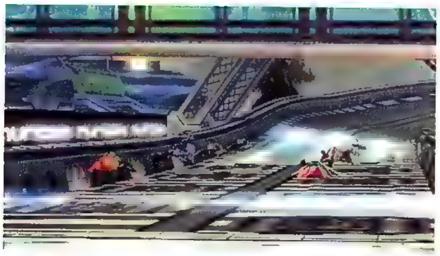
VERDICT

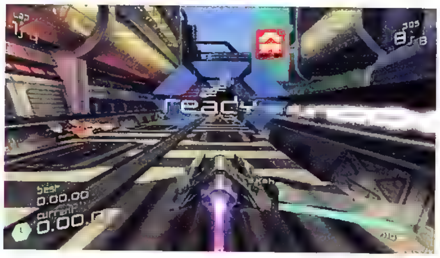
✓ **Classless gameplay, frontlines mechanic, blowing up tanks with RC bombs**

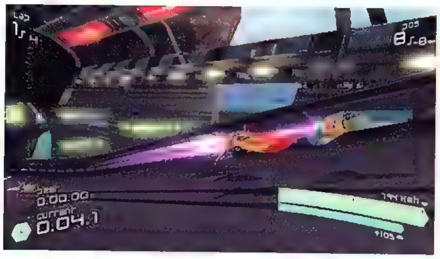
✗ **Not the prettiest game, some vehicles seem poorly balanced**

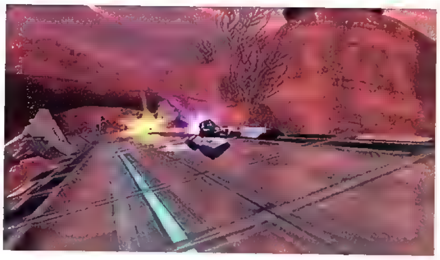
SCORE **8.0** OUT OF 10











WipEout Pulse

It's all techno beats and fast hovercars – that's how **David Hollingworth** rolls.

We at Atomic have been Wipeout addicts across multiple consoles and spellings of the franchise. It's what made us buy a Playstation back in the day, and was a nostalgia-laced delight in the days of the PS2. Taking the game mobile with the preceding Pure seemed, at first, a gamble, but it's one that continues to pay off. Within minutes of loading the game's UMD into our PSP, we had assumed the Wipeout 'position' – relaxed, on the lounge, kinda slouched, and rocking back and forth to every nuance of the track.

On the surface, it's a pretty classic Wipeout – capital 'e' be-damned! – release. You pick your team (old school Feisar, in our case), pick a difficulty and race away in campaign races that track your progression through a series of 'grids', which is really just another name for a season of racing and tracks. There's also single race modes to get lost in. If you've played any of the previous game's, from the breakthrough 2097 through to Fusion, you know the breathtaking sense of speed the game generates.

Pulse is no different, but it does bring a couple of new elements, the most notable of which are actually independent of the game itself. First up, and possibly the best addition to a Wipeout game since *Prodigy's* Firestarter (we dare any veteran not to feel the controls under their fingers when they hear that track), is the ability to log onto the official Wipeout website and design your own racing colours and textures, which you can then download into the game. It may not seem like much, but the Shockwave-based designer is almost as addictive as the game itself, and you can either paint directly on to the craft of your choice, or get down and dirty with the textures themselves.

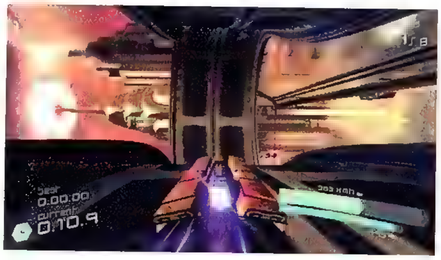
The site also allows you to see how clumsy and ham-fisted your attempts at gracefully managing each track really are, by letting you track the fastest times of some of the shut-ins who obsess over these kind of rankings. Because, really, if all that counts in your life is beating 24 seconds to lap a track, fine, go ahead WASTE YOUR LIFE!

Not that we're bitter (or desperately trying to skill up to get our own name on the site *–ed*).

Ahem, anyway… there's also wallpapers, tracks and music to download.

As to the racing itself, it's pretty much the tried and true stuff fans have come to expect. The tracks are twisting combinations of claustrophobic tunnels and airy concourses, with dips and jumps to complicate procedures; the Mag-strip is a new feature that lets the track twist into some radically different directions at some remarkably sharp angles. The music is top notch, and familiar names, like *Aphex Twin*, are in full effect, while any fan of electronica will doubtless find new bands to adore from the track listing.

WipEout Pulse is a wonderful example of how to bring out a new game in a series without compromising the old formula that made the franchise so popular in the first place. That said, as good as the experience is on the PSP, it's really only a placekeeper until the release of the next 'proper' title on the PS3, which is rumoured to be using the MotorStorm engine. Oh, that'll be so pretty… and maybe even a reason, for a lot of people, to finally buy a PS3.



Developer **Sony Studio Liverpool**
Publisher **SCE**
Website **http://wipeoutpulse.com/**

VERDICT

✓ **Matchless speed; great music; excellent extra content**

✗ **We still miss the Designers' Republic look and feel; my cramping hands**

SCORE **8.5** OUT OF **10**

MISSION OBJECTIVES_
Objective A: Secure ammo dump »
Objective B: COMPLETED
Objective C: COMPLETED
Objective D: Download data from enemy computer »

PC COLLECTOR'S EDITION

INCLUDES:

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- Bonus disk including the game soundtrack, behind the scenes videos, wallpapers and more
- Stray Dogs insignia patch
- Deck of Frontlines playing cards, each card featuring a different weapon, vehicle or drone
- Art of Frontlines book
- Poster

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MISSION OBJECTIVES_

Objective A: COMPLETED

Objective B: COMPLETED

Objective C: COMPLETED

Objective D: COMPLETED

The Frontline is moving forwards »

*32 player for Xbox360

M

Moderate battle violence, Gaming experience may change online

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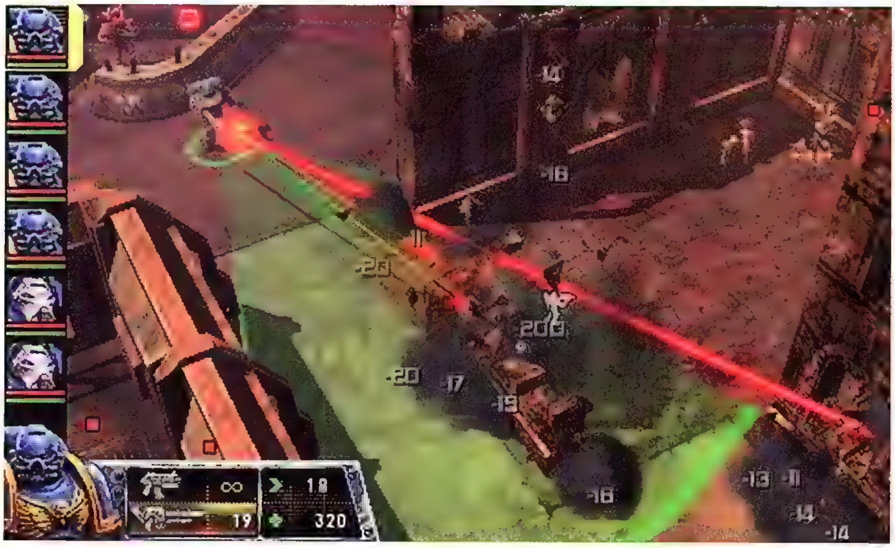


Warhammer 40,000: Squad Command

With the bolter, cleanse the unclean. David Hollingworth will cleanse!

The Warhammer 40,000 universe has had a long history, both on the tabletop and in digital form. The first edition of the rules came out last millennium, and already there are rumours that the most recent fourth edition is to be replaced by a fifth. The popularity of the game is based on simple rules, flavourful back-story and spectacular miniature design. Sometimes this translates well into a computer game, as it does – and continues to do so – with the Dawn of War series. Other times, it just doesn't come off, as a little of unsuccessful strategy and action games, from the moody Space Hulk all the way up to the poorly realised Rites of War.

Then there are those games that only a 40k fan can really love, like Chaos Gate or Final Liberation. Where does Warhammer 40,000: Squad Command, the first 40k title to be released on a mobile platform, stand?

It's actually not an easy question to answer, especially if you are a raving fan of the game and its dark universe of war and questionable morals. Squad Command offers both a single player campaign and ad hoc and online match up capability. In the single player campaign you take on the role of a commander of one of the Emperor's finest Chapters of space marines – the honourable Ultramarines (can you guess what army the editor plays? *–ed*), defending the ravaged planet of Rhur III against an invading army of the disciples of Chaos. In gameplay, and frankly in story line as well, the game seems more of a sequel to Chaos Gate, offering turn based strategy rather than the dynamic RTS of Dawn of War.

You start out controlling a small squad of scouts, then graduate to actual space marines, then an array of vehicles. As your own forces get stronger, so too does the enemy's, but each scenario and map effectively trains you well for the next challenge. Each of your marines or vehicles is controlled by expending action points to move and shoot; in a nice change, you can choose to spend more AP on a given shot to make it more accurate. There's really not a lot more to the gameplay, though as the interactions between different troop types open, the things you can do to beat a level increase as well.

This feeling of tackling each challenge how you want, not how the game wants, is helped along by nearly every piece of terrain – walls, generators, pipes etc – being destructable. You can choose to flank an enemy, pinning opponents in place with sporadic fire from hidden positions, or blast holes in the scenery with hot plasma before storming the breach – or any combination of the above. Sometimes you can even sidestep most of the enemy entirely if your mission, for example, is simply to take out one leader.

It's simple to get a hold of, and a lot of fun, but the simple controls still don't feel entirely comfortable without a mouse to really direct the action. Moving the command cursor about with PSP's direction buttons can be a little hit or miss, and the limited camera angles on offer can make actually seeing the enemy or an open path tougher than it needs to be. That said, there is an option to switch to a simpler overhead map; we found ourselves using this often, at times after every move in more complex missions. Also, the sound, while convincing enough, is rather small and tinny – but that's more an issue with the PSP. Finally, while multiplayer match ups are fun, and where you can expect to get more depth and longevity, good luck finding any games for the time being.

Squad Command is getting a pretty cool reception online, but we have to say it does seem a little unfair. To our eyes, we'd much rather see a pretty fair representation of 40k that we can take with us on planes, trains and Baneblade superheavy tanks than have no representation at all, and the simplistic gameplay does make for a game that lends itself to the PSP's strengths.

Enough talk. Only in death does duty end, and there are many more foes of the Emperor to kill, kill, kill.

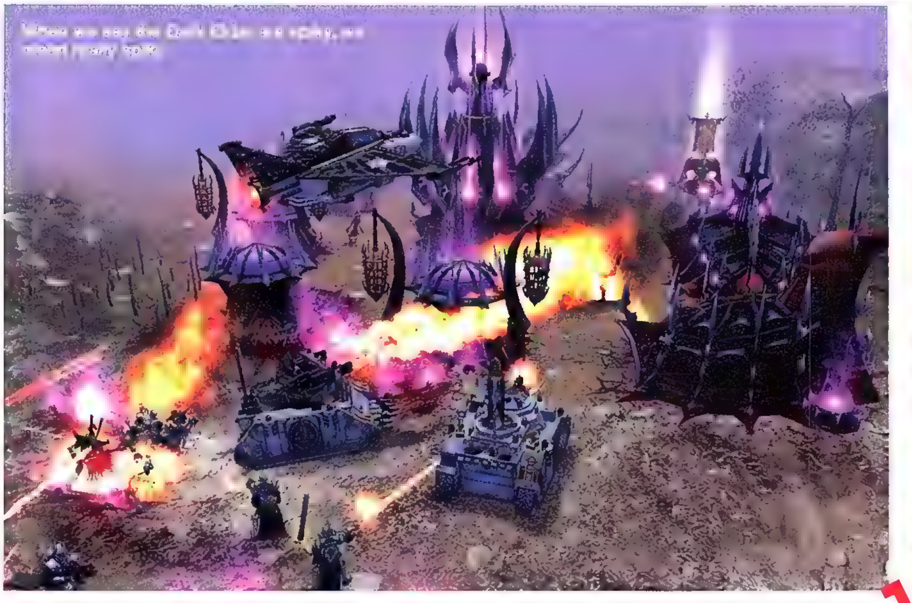
Developer **RedLynx**
Publisher **THQ**
Website **http://www.squadcommandgame.com/**
Other platforms **DS**

VERDICT

Flavourful cutscenes; simple gameplay; the love of the Emperor ✓

Dodgy camera position; simple gameplay; difficult controls ✗

SCORE **7.0** OUT OF 10



When we say the Dark Eldar are spiky, we meant really spiky.

Warhammer 40,000: Dawn of War: Soulstorm [Preview]

Looks like that last cleansing didn't quite take. David Hollingworth heads back to the 40k universe to try again...

If the previously reviewed Squad Command is the little 40k game that nearly can, there's no doubt that Dawn of War and its expansions is the real deal – a bona fide conversion of the Warhammer 40k universe into RTS form that keeps all the darkness and bone-shattering violence while shifting the gameplay into new and fast-paced directions.

Soulstorm is the third and final expansion to the original game, and adds to new races to the mix, as well as new gameplay modes and new toys for all previously released races. Following the goodguy/badguy model of the Dark Crusade, players who like to at least delude themselves they're on the side of right can play the highly religious Sisters of Battle, while those who revel in their dark side can reap souls and slaves with the Dark Eldar.

All we've had a chance to play with so far is the Dark Eldar, but they bring a host of new tricks, tactics and downright evilness to the battlefields of the dark millennium. Like their cousins, the Eldar (who have been in the game since the original release), the Dark Eldar are a frail and ancient race. However, while the Eldar chose and grace and discipline as their guiding lights once their civilisation fell, the Dark Eldar simply threw caution to the wind and have descended into depravity. Did we mention that 40k is kinda dark?

The look and feel of the Dark Eldar is perfectly captured from the reams of art and miniatures. The infantry all sport cruelly barbed and spiked rifles, while sleak, open-topped vehicles scream overhead to deliver payloads of bloodthirsty attack troops. Speed and cruelty is the name of the Dark Eldar game, and they have a range of special abilities to help them overcome the frailty of their race.

Chief amongst them is the ability to harvest a unique resource – the souls of their fallen enemies. This manifests as a purple mist that hazes the battlefield, as well as being generated by add ons to some of the Dark Eldar buildings. Harvest enough souls, and some mighty fine powers open up – *Soulstorm* is probably the most impressive, letting rip a huge maelstrom that can pretty much destroy anything that crosses its path, but you can also use *Corrosion* to degrade enemy vehicles and *Screams of the Damned* to lower the morale of all enemy units.

These powers must be used in conjunction with what little units you have on hand at any one time; to express the dying nature of the Dark Eldar race, the army has a low level cap, and so you really can't afford to throw away squads. However, if you dream of micro-management, you'll love the way this army plays, and will quickly warm to co-ordinating jump-jetting Raiders that can drop off a load of morale-sapping Wyches as you unleash a devastating map-wide Scream, all the while using Reaver jetbikes to harass and confound the enemy on multiple fronts.

The new meta-campaign mode is essentially an upgrade of that found in Dark Crusade, and takes place across multiple planets and moons. Also new is the addition of flying units, and every race is getting one, from Marines' Land Speeder Tempest missile boat to the Tau's Barracuda fighter bomber. And once again, you don't need the previous games to enjoy this one – all races are present in the campaign, though you can only play the two new ones online. Still, it's great to see this generosity continuing. We can't wait to get some more time in with the Eldar and to take the Sisters of Battle for a spin, but so far the game is looking very promising.

PC

Developer	**Relic Entertainment/ Iron Lore Entertainment**
Publisher	**THQ**
Website	**http://www.dawnofwargame.com/**

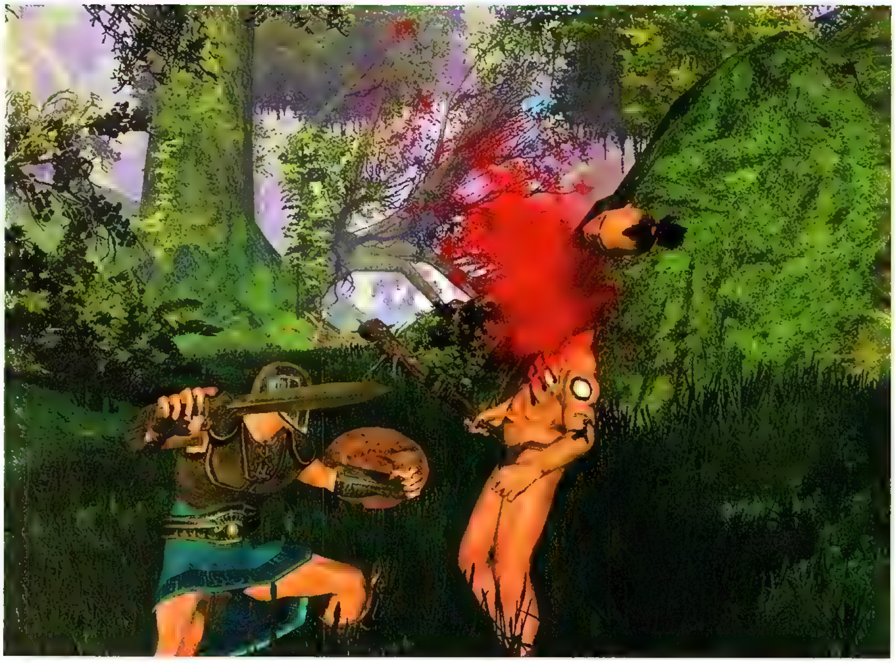
VERDICT

✓ **Promising new units and races; standalone game**

✗ **Engine starting to look old; extreme micromanagement necessary**

ANTICIPATION RATING

8.0 OUT OF 10



SNEAK PEEK: Age of Conan

Between snorting hookers and haggling with coke at CES, **David Hollingworth** managed to catch up with a famous barbarian...

For a good long while it seemed like World of Warcraft might be the dominant force in MMOs, so much so that the entire genre seemed in danger of stagnating under the weight of the 10 million subscriber behemoth. These days, while it still seems unlikely that anyone is going to overtake the monster, it's nice to know that not all developers are too overawed by its success. Lord of the Rings Online reached release last year to much acclaim and even the odd game of the year award, and this year it looks like we'll see at least another new and fresh take on meeting people and hitting them with sticks – Funcom's Age of Conan: Hyborian Adventures.

The game has been on the radar since 2005, and its won a swag of best of show awards at various E3s in that time. For those few who have been under a rock (and it must be one helluva rock to miss something this big) Age of Conan is, well, an MMO take on Robert E. Howard's world of Hyboria, the home of mighty thewed Conan the Barbarian – we assume you've heard of him, or at least seen the fine film with Governor Schwarzenegger (who, incidentally, keeps Conan's sword in a glass case over his office desk).

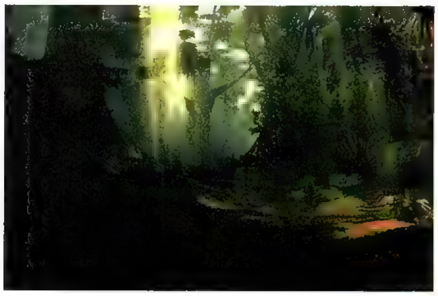
Hyboria is very much a low fantasy world, and in keeping with that there are only three races to play, and all of them are human – Aquilonian, Stygian and Cimmerian. Character creation is a uniquely drawn out affair, too; you start with creating a very customisable toon of a given race, and then you're let loose into the world. You don't actually choose your archetype until level five, and don't specialise further until level 20. For example, after clubbing a few gorillas and pirates to death, your level five Stygian might decide that the Rogue archetype is where her talents lie, and then at level 20 will finally have the chance to branch into a fully blown Assassin. Stabbity ensues.

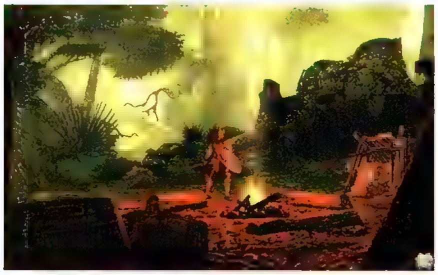
In another change from the standard MMO fare, you can also choose to play those first 20 levels as a single player, or to earn them online with others.

The big difference with Age of Conan, however, is the Real Combat system, and we got to have a play with this at CES. Rather than the usual MMO combat, which relies upon picking a target and then cueing up various auto-triggered attacks (Tab to target, key 1 for an Attack, key 2 for Funky Attack, key 6 to Breakdance on corpse), Age of Conan features a fluid, targetless system. You can swing your blade in one of three directions, and if a target's there to be hit, it'll be hit. Similarly, you can choose to defend in a given direction, or even actively move out of the way entirely, only to dance back into range to make your own attacks.

In practice the idea is solid, but it does take getting used to, and it will intimidate a lot of MMO stalwarts who have never really had to test their trigger reflex. Similarly, more action oriented gamers may well find the prospect of this kind of combat a reason to finally explore online RPGs. However, while it played well going up against NPCs on a system that was geographically 'close' to its server, we're still unsure how this will play out when you're logged in from Australia and playing on a US server. Given that the game does feature a lot of PvP play, lag could very well prove the undoing of the game early on, but we've been promised it's definitely being worked on.

What is working quite well already are the graphics – the build of the game we played was running under DirectX 9 and looked absolutely spiffy. Well, as spiffy as a hairy blood soaked barbarian can get. There were some texture drop in issues, but the frame rate was solid and the game was certainly more than playable. This is definitely one to look out for.





PC

Developer **Funcom**
Publisher **Funcom/Eidos Interactive**
Website **http://www.ageofconan.com/**

VERDICT

Fluid combat; gritty visuals; unrepentantly gory gameplay ✓

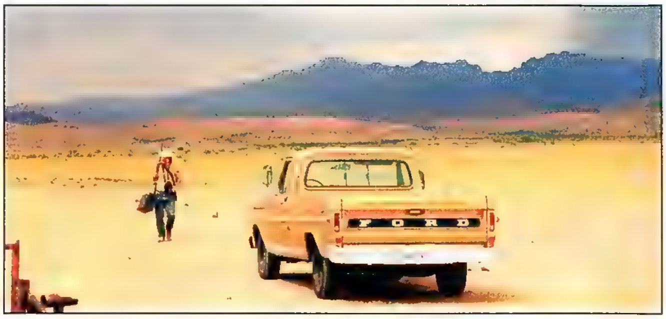
Possible lag problems; fanbois will miss any elven races ✗

ANTICIPATION RATING

8.5 OUT OF 10

CULTURESHOCK

Everything you need to know about geek film, music and literature.



No Country for Old Men

CINEMA Director Joel and Ethan Coen
Starring Tommy Lee Jones; Josh Brolin, Javier Bardem

A hunter stumbles upon a drug deal gone wrong and walks away with a touch over two million dollars. In no way could this man be considered lucky, for such a fortune is no doubt the sort of thing its true owners would wish to reclaim. As the film's tagline so aptly puts it, there are no clean getaways. Based on the 2005 Cormac McCarthy (think *The Road* and *Blood Meridian* – both of which are being filmed as your eyes consume this sentence) novel, *No Country for Old Men* is the latest work of the Coen brothers (think *Fargo* and *O Brother, Where Art Thou?*). And boy is it good – a pleasingly subtle, Hitchcockesque thriller powered by a sparse but smart script, universally brilliant performances (I dare anyone to read the excellent novel the film is based on and not hear the voices of each actor *-ed*), a nifty compressed air gun and Javier Bardem's hair. This isn't the kind of thriller you're used to. Much like the author of the source material, Joel and Ethan Coen have a lot of fun with the conventions and audience expectations of the genre. *No Country* is neither heavy in stylisation nor rapid in pace. The plot moves slowly, building and building and building up to... well, you'll see. Do see this movie, folks. As has been noted in numerous other publications, it's Academy Award material. Whether or not it walks away with that prize – and whether or not you give a shit – there's no denying that Bardem's do is truly epic. A masterpiece of locks that conveys equally his character's mysteriousness, creepiness and evilness. Call it, friendo. **CT**

score 9.0 OUT OF 10

American Gangster

CINEMA Director Ridley Scott
Starring Denzel Washington; Russell Crowe

Denzel Washington could kick your arse and he'd look cool – cooler than you could ever look – doing it. His latest vehicle, *American Gangster*, is a biopic of Frank Lucas, heroin king of Harlem. A chronicle of the rags-to-riches-to-rags-again journey of this notorious dope dealer. *Gangster*, as you'd imagine, is quite a dark film – relatively free of puppies and kittens and life-affirming moments – and much time is spent emphasising how truly wily and skilled Lucas must've been if he managed to get to the top of the Italian-dominated drug game as a black man. Washington's performance as the kingpin is thoroughly convincing. Violent thug this dramatised version of Lucas may be, but he carries with him an air of respectability, without ever seeming sleazy like so many of his European counterparts do in similar productions. Russel Crowe's performance is rather good too. He's the obligatory detective character. A real highlight, though, would have to be the supporting cast, made up of folks who've previously graced the small screen in much-loved shows like *The Wire*, *Deadwood*, *Entourage* and *Eureka*, as well as the recent – and equally good – movies *Talk to Me* and *No Country for Old Men*. Much like a film we reviewed last month, *Rescue Dawn*, *American Gangster* has been branded largely inaccurate. And, like with Dieter Dengler and Dawn, the subject of the film – the real Frank Lucas – is the first to admit many liberties have been taken by director Ridley Scott and writer Steve Zaillian. But who cares? *American Gangster* is a bloody good gangster movie. And Denzel Washington makes for a very cool gangster. **CT**

score 8.0 OUT OF 10

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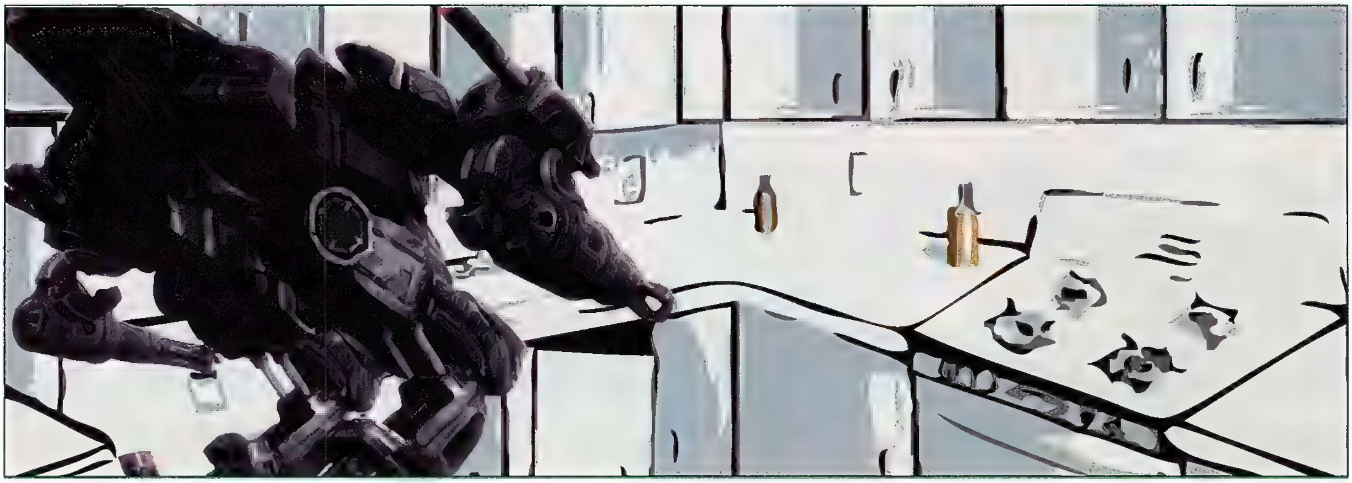


Army of me

I plan to take over the world. Doesn't everyone?

Like most women, I want my own robot army: a horde of powerful drones to crush all opposition during my rise to ultimate power.

As we know from countless movies, being a dark lord or vile temptress of doom requires minions. But in every movie, the all-too-human minions, henchbeings and lackeys either screw up and release the hero, cower at the wrong moment or mutiny. You just can't get good help these days.

For that reason, I've never seriously considered employing my fellow human beings in my rise to infamy. Fun though that would be.

Robotics on the other hand, gives every appearance of simplicity. Program your automated assault or infiltration devices with your agenda, and you can avoid all those messy human errors.

But have you noticed what's happening in the current state of robotics?

We're turning robots into 'women'. Not the fembots of Buffy or Austin Powers, but servile creations like the Roomba, which take on the grubwork traditionally done by women: cleaning and looking after old people.

Don't get me wrong, it's a good development overall. It frees actual women to perform the tasks we really want to do, like taking over the world. And I don't mean that metaphorically, in some kind of "yay! sisterhood!" sense.

On the other hand, a robot army bearing dusters sounds a bit wishy washy: "Surrender, or we will tickle you into submission! Now go to your room!"

No, I want to be more like Mom, from *Futurama*. Mom, owner and founder of Mom's Friendly Robot Factory, has a penchant for creating giant militaristic killer-bots. She only has to flick a switch to turn every robot she's ever created into a violent single-minded assassin. An army of deadly vending machines sounds kinda cool, but there's a certain lack of style involved in standing on a mountain, with an awesome backdrop of dark and sinister clouds, cackling with glee… and tugging a vicious toaster on a leash.

Maybe I could wait for true AI, but as I illustrated in last month's column, the problem with sentient electronics is that it has its own agenda. You've seen *Terminator*, right? And that's assuming androids won't have those namby-pamby Asimov's three laws built into them.

> "It took a total of four weeks and, once complete, the heart started to beat spontaneously. Now that's weird science."

All is not lost, though. A combination of four recent technologies will finally give me my birthright.

In the last couple of years inkjet printers have been specially modified by biologists so that they can create tissues and organs. Scientists set up a kind of biological blueprint of connective tissue and then, using cartridges filled with the right kinds of cells, print out a layer of liver, for example. Scientists at Clemson University who pioneered the technique are using it to study breast cancer.

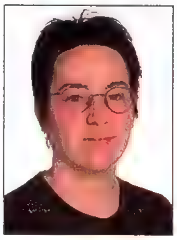
In a similar vein (no pun intended), a group of scientists here in Australia have used stem cells to build a three dimensional heart on a biodegradable scaffold. It took a total of four weeks and, once complete, the heart started to beat spontaneously. Now that's weird science.

And in January a scientist named Samuel Wood announced that he had cloned himself by implanting skin cells in a woman's egg.

But biologists aren't the only ones having fun. 3D printer technology is advancing at such a rapid rate that Summit ID, a 3D printer manufacturer, produces selective laser sintering (SLS) printers that can, layer by layer, fabricate spare parts for battleships so that they avoid the need to carry around a warehouse of components.

Who better than me to print out layer after layer of various cloned Zara tissue, then slap them together on a 3D Zara-shaped scaffold and watch as my creation springs into life? In high school, I was voted the "girl most likely to clone herself and take over the world". I wanted to be a mad scientist when I grew up, and I have a degree in genetic engineering. Once I print my army of clones, we'll all have the same agenda, and together we can take over the world. Or fight over whose turn it is to take out the rubbish.

At the very least, we can have some wicked LAN parties.



Are you scared of Zara and her print-clones too?
zbaxter@haymarketmedia.com.au

TECHNIQUE

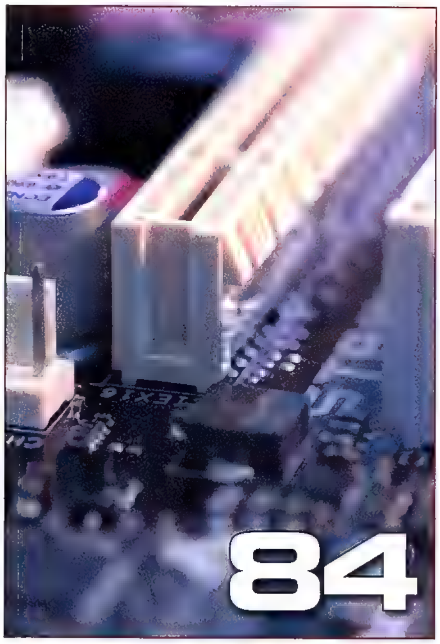
HANDS-ON TUTORIALS FOR THE TECHNICALLY INCLINED

There's a bit of something for everyone in this month's packed-to-bursting Technique section. Whether you harbour a desire to master the esoterica of memory timings, or prefer a more hands on approach, we've got your back.

Memory, as Josh Collins says, is freaky stuff. But not so freaky that he can't take you through the ins and outs of the stuff, what to look for amongst the arcane codes and how to fiddle them to even greater speeds and performance.

And it's tools aplenty in Ron Prouse's latest project, building a cooling tower for your PC that has a certain industrial charm...

Of course, Chris Taylor also offers some words of wisdom to IT job hunters, and what they can do to improve their employment chances. Enjoy!



TECHNIQUE CONTENTS

Memory tweaking 84

Josh Collins gets his big brain on and runs through the fine and intricate art of getting the most out of your precious memory.

Cooling Tower pt1 90

We just can't keep Ron Prouse out of his shed! This month he starts in on a curious build – an office block style cooling tower to keep your PC running cold. Legionnaires' Disease not included.

Atomic.edu 94

Chris Taylor looks at how to get ahead and impress people in job interviews and other IT employment situations. Who knew experience was so popular?

IO 96

It's Dan Rutter at his best, and most informative.

Fallout 98

It's Logan Booker at his best, and most... well, sometimes it's hard to tell. But it does involve a missile launcher. Eventually.

Win one of 20 passes to see Jumper! Only in cinemas February 14

We've got 20 passes to go see the sci-fi action blockbuster Jumper, starring Hayden Christensen and Samuel L. Jackson. All you have to do is head to our site and answer a deceptively easy question. Jump to it!

www.atomicmpc.com.au/competitions

DIFFICULTY **INTERMEDIATE**

Memory tweaking

Mmm… memory… Josh Collins loves the stuff.

Computer memory, aka Dynamic Random Access Memory, aka DRAM, or whatever name you wish to refer to it by, is a core component of any computer system. As enthusiasts, memory can be a primary ingredient to increasing the overall responsiveness of a system and reducing hard drive thrashing due to over use of the page file.

Throughout this tutorial we'll be discussing a number of areas key to memory performance and specification. We'll go through the dizzying amount of letters and numbers that tell us whether the sticks are the good shit or better relegated to the family PC. Also discussed will be the relationship between latencies, the preferences and relationship between frequencies and latencies as well as the methodology for tweaking memory for best overall performance.

Due to the current enthusiast market landscape, we'll be discussing the topics in relationship to the most common current gaming and benchmarking platform – the Core 2 Duo or Core 2 Quad based system. These systems commonly run on the following chipsets:

- Intel P965
- Intel P35
- Intel X38
- NVIDIA 680i

There are other relevant chipsets, such as Intel 975X, ATI RD600 and Intel G33, however these are not as commonly found as the previous four mentioned chipsets.

The information contained in this guide is predominantly founded on experience based on an Intel platforms (memory controller in chipset), however it is still applicable on many if not all levels to current DDR2-capable AMD platforms (on-die memory controller).

Breaking down the numbers

Memory is marketed in such a way as to allow for a large quantity of information to be made available to the reader at a glance. The problem begins when the majority of people have no idea what these numbers and letters mean beyond the capacity of the modules in either megabytes or gigabytes.

First and foremost we need to break down this barrier and make the true technical specifications of a memory module understood. For this break down we'll be using the following specifications, which by now have become rather common place in the enthusiast market.

1024MB (1GB) DDR2-1066 (PC2-8500) 5-5-5-15 2T 2.2v

To aid in deciphering this information and for ease of reference, the above text has been colour referenced. Below is a description for each colour-referenced piece of data:

Blue: The simplest of the lot, this is the capacity of the memory module in question. The capacity of the stick is generally referenced in megabytes (MB) however can also be referenced in gigabytes (GB) as well. The majority of modules currently sold are of the 1024MB variety, with two in a kit culminating in a 2GB (total capacity) pair.

Red: The red alpha-numerical set depicts the operating frequency of the memory module. With DDR representing 'double data rate' and the frequency represented in megahertz (MHz), a bus speed of 533MHz is represented as an effective 1066MHz due to the double data rate operation. The numeral after the DDR notification states the memory standard of the module, in this instance the module adheres to DDR2 specifications.

Green: The green alpha-numerical set is often used in correlation with, or instead of, the red alpha-numerical rating. Like the red rating, the number after the letters 'PC' indicates the memory to be of DDR2 specification – a one or nothing would indicate DDR1 and a three would indicate DDR3 specification. The PCx-xxxx rating depicts the bandwidth of the modules. The bandwidth is calculated with the following equation:

Bandwidth = transfers x number of bits in a byte (8)

For example PC2-8500 would be shown:

8500 = 1066 x 8

Note: The bandwidth is rounded to the nearest 100 value. The complete bandwidth value for DDR2-1066 memory is PC2-8528 however this is rounded to PC2-8500.

Pink: These numbers, split by hyphens, tend to leave most people at least a little confused. The numbers indicate the primary latency timings, also commonly referred to as alpha timings, of the memory modules. The numbers define the following settings:

tCL – tRCD – tRP - tRAS

The full meanings for the abbreviations are:

tCL: CAS Latency Time
tRCD: DRAM RAS# to CAS# Delay
tRP: DRAM RAS# Precharge
tRAS: Precharge Delay

There is another latency to be aware of, however, and it comes from the secondary latency set (which is not often displayed) and is referred to as tRRD. Depending on the relationship of this latency to the chipset's functions, this can sometimes be blamed for Front Side Bus (FSB) manipulation. If hitting an FSB wall, try loosening this setting by one or two values. If no changes are found, tighten up the values again to the original or tighter timings to maintain responsiveness.

A classic example of tRRD influencing FSB was on the initial release of the GIGABYTE GA-X38-DQ6 which could run tight timings, such as:

tCL: 4
tRCD: 4
tRP: 4
tRAS: 10
tRC: 4

But to push through to high 500MHz to 550+MHz FSB, unlike competing manufacturers with X38 boards that can maintain tight tRRD settings at high FSB, the GA-X38-DQ6 could not; as such it had to have the tRRD relaxed to a value of eight or nine to succeed at high FSB overclocking. Interestingly the GIGABYTE board didn't incur a hefty performance hit for requiring such a relaxed setting change to this particular secondary latency.

As these settings all indicate latency values; for maximum performance the latencies should be set as tight as the memory modules will allow for a given frequency while maintaining stability and reasonable voltages.

Purple: The purple alpha-numeric indicates the command rate that the memory operates at. This rate is commonly set at a value of one command per cycle, known as 1T, or two commands per cycle, which is known as 2T.

The command rate indicates the numbers of cycles before the next line of commands can be issued. Therefore, issuing commands every cycle opposed to every two cycles will often obtain increased performance. How big this gain is depends on the chipset and other factors outside of this tutorial.

In the DDR1 generation performance memory ran on a 1T command rate and commonly a strong memory performance deficit would be incurred if set to a 2T command rate. With the initial move to DDR2 the only command rate available (and only for Intel platforms for a number of years as AMD maintained the use of DDR1) was 2T. This in effect brought with it the expected memory performance deficit.

Interestingly, as development continued, especially on the side of the platform chipsets and the continued development and performance increase of DDR2 memory, this deficit was soon made largely insignificant unless you were chasing every last drop of performance from the system. Intel chipsets started to support a 1T command rate, however many enthusiasts found minimal performance gain and further restrictions on the maximum frequency and latencies when utilising the 1T command rate. That said, the gain of 1T opposed to 2T command rate is almost always appreciated by the hardcore performance nut.

Orange: The orange value indicates the amount of voltage to be used for a given set of memory modules. This can also be represented as a range, for example 2.0v – 2.2v and is inclusive. The voltage value is given to define the general voltages needed to maintain the stock frequencies as given in the rest of the module specifications. It has been quite common to find these voltage values to be a little generous to assure every stick specified to run the given timings can do it. Often the memory, particularly when Micron based, can either run the specified timings at less voltage or run considerably tighter timings and/or higher frequency. For example, the majority of Micron D9 based memory (particularly D9GMH and D9GKX ICs) can operate at DDR2-1000 4-4-4-12 when rated for DDR2-1066 5-5-5-15 or DDR2-800 4-4-4-10.

Oh yeah, that's the good stuff right there.

Tweaking memory – but where?

For those uninitiated into the world of system tweaking, all the best and most stable tweaks are commonly done on the lowest basic level of the computer system, the BIOS.

Given the nature of the size of the motherboard market and then even the differences between models within a certain manufacturer's range, we won't be focusing on a single motherboard BIOS. We will however give some handy hints. These are:

- The simplest but most necessary; hit the delete button during POST to enter the BIOS.
- The memory tweaking options are commonly associated with the chipset options. This is due to Intel-based systems hosting the memory controller on the North Bridge of the chipset as opposed to on the CPU die as with AMD processors.
- Many high-end motherboards now have a dedicated overclocking settings section in the BIOS. To make overclocking easier, common overclocking settings such as FSB frequency, memory dividers, CPU multipliers, PCIe bus frequencies and memory timings are all in the one place.
- To obtain access to the advanced memory timings on a GIGABYTE motherboard press the keystroke CTRL+F3 to get access to the settings. This will also open access to additional overclocking settings.
- If you're not sure, test it. If the system fails to boot simply clear the CMOS and load the fail safe defaults and start again!

In voltage, the power is

As everyone is aware, the voltages of different components in a computer need to each be not only set appropriately for the piece of hardware but be supplied in a consistent fashion. With voltages stable and set appropriately, maximum performance and stability can be obtained from a system.

When it comes to memory it is important to assure the necessary and appropriate voltages are set. This optimum value for the amount of voltage supplied to the memory is dependent on the intended frequencies and latencies. In retrospect, this is first influenced by not only the type of ICs used on the modules but also the bin level they have been obtained from for the module.

Module voltage	DDR type	Likely IC
2.0v – 2.45v	DDR2	Micron D9
1.9v – 2.2v	DDR2	ProMOS
1.8v – 1.9v	DDR2	Elpida
1.9v – 2.1v	DDR3	Micron D9
1.7v – 1.9v	DDR3	Qimonda
1.6v – 1.8v	DDR3	Elpida

It can often be figured out what ICs are on the modules just by the voltages used. Below is as a table of ICs commonly found in the market and the voltages that they run on.

It has become common place for Micron ICs to not only utilise more voltages as a stock reference value given by the manufacturer but also to scale with excessive voltages when pushed to the edge by enthusiasts, especially extreme overclockers.

The responsiveness of Micron D9 chips to additional voltages is a strong reason behind the enthusiast love affair with the IC series. A great example is the great majority of Micron D9 based PC2-6400 C4 kits being capable of 1000MHz to 1100MHz while maintaining common C4 timings sets such as 4-4-4-12 with little voltage adjust necessary. The better quality the IC, the higher the chip can raise the frequency while maintaining tight latencies and using minimum voltage.

Below is a table showing the significant difference between ProMOS and Micron D9 chips at the common voltages of 2.0v to 2.2v. The figures are a common average and taken for reference. There will always be outliers in any batch of chips; however the large majority will stick to the following pattern:

Micron binning table

Grade	Clock	Timings
-5	200MHz	4.0-4-4
-5E	200MHz	3.0-3-3
-37E	266MHz	4.0-4-4
-3	333MHz	5.0-5-5
-3E	333MHz	4.0-4-4
-25	400MHz	6.0-6-6
-25E	400MHz	5.0-5-5

The binning process

Speed binning is progressive and selective testing of all modules destined for a particular product line, for example Corsair's popular Dominator series. This process allows for the best of the best modules to be pre-tested and selected for use in the top kit from this series. As the quota is achieved for the top level of performance, the binning process continues down throughout the product line, selectively and effectively filtering out the hardware for the given price and performance ranges.

Memory is freaky stuff, as it's important to know which chips within a given IC range are hot to trot and which are not. For example when the original DDR2 'fat body' D9s (92-ball FBGA) came out, the sexy ICs were the D9DQW and D9DQT chips – the rest were okay but not stellar like these. In the currently available generation (60-ball FBGA), the entry into performance ICs are the D9GCT chips, but the golden boys, like the ol' fat bodies, are the D9GMH and D9GKX. Now, you'd hope things were simple and aim to get the D9GMH or D9GKX but it's not quite like that.

The initial release of these two sets in particular showed the D9GKX to be the cream of the crop and the D9GMH second to it. However when looked at closer, it was the initial binning from Micron which was setting these aside. The D9GKX chips were -25E binned while the D9GMH were initially binned for -3 speeds (see Micron binning table for more info).

What this meant was that in the end result, the D9GKX were obtaining higher frequencies with tighter timings and using less voltage to do so. As the manufacturing process was refined, the D9GMH started to obtain -25E binning. When this occurred the enthusiast IC market shifted, the D9GMH seemed to be a bit hardier than the D9GKX in that they could consistently take more voltage and for longer than the slightly more fragile D9GKX.

Memory can also be binned according to a single chipset and as such can pull much greater performance on a given chipset compared to another. A great example of this is the Corsair Dominator PC2-10000 C5 modules, as they're binned and tested specifically for the NVIDIA SLI chipsets (650i, 680i, 730i, 750i, 780i) and perform exceptionally well on that platform, as do the rest of the high-end Dominator kits. There are complications, though, such as being restricted to PC2-9600 or lower on other chipsets unless manually

configured. That said, the Atomic labs' Dominator PC2-10000 C5 are still the strongest kit of memory we've tested on any chipset, ranging from 680i to P965 to X38.

Another area we've not touched upon is bin overflow or 'aggressive binning', where the manufacturer bins for a speed level and then dumps all or part of that level down a grade to make an aggressive series or, as enthusiasts have found, an aggressive batch or batches. These aggressive batches are often the first runs of the product line and garner great initial coverage for the new modules. For the truly slimy, there were a number of brands releasing PC2-8500 C5 kits with Micron D9 based chips, to then a few months after release switched the ICs for the cheaper and less overclockable ProMOS chips.

Getting to know your kit

Tweaking changes on a kit to kit basis, obviously firstly dependent on the ICs used but then also dependent on the bin level from which the chips were selected, through to the tolerance for a given kit to respond to additional voltages.

So now you know what all those numbers and letters mean, it's time to truly get to know your memory. To do so a number of applications will come in handy. These are:

Memtest86+ – www.memtest.org
MemSet – www.tweakers.fr/memset.html
CPU-Z – www.cpuid.com/cpuz.php
Everest – www.lavalys.com
Stress Prime 2004 Orthos – www.sp2004.fre3.com

This list of software will allow for different levels of testing and diagnostics focused towards system memory. For some individuals, these pieces of software have become second nature while tweaking a system. For others, well, they'll feel bewildered and lost. For the latter group, we're going to break down what each does and how it is involved in the tweaking process.

Memtest86+: This DOS-based and launched software is one of the most renowned and well known memory testing suites. With little to no OS overhead due to booting from DOS bootable discs (3.5in floppy or CD), this software stresses the memory, running through passes whereby the memory is addressed, has a piece of data written which is then read and checked against a checksum. This is one of many testing techniques used by the software to test for bad memory blocks be it a hardware failure occurring or instability from tweaking the relationship between frequency, latency and voltage. To be considered 'Memtest86+ stable' the system should run through at least 30 passes of the testing suite. It is important to note that the time in which this testing will elapse will increase as the memory modules increase in capacity.

> **“These aggressive batches are often the first runs of the product line and garner great initial coverage for the new modules.”**

MemSet: An application launched from within the OS, this software allows

access to the primary and secondary latencies for tweaking on the fly. The level of access to the latencies can vary depending on the timings available within the motherboard itself and on the level of support for the chipset and motherboard manufacturer by the software. For the majority of enthusiast chipsets and motherboards, full access to all primary and secondary timings are available – however the CAS latency cannot be altered within the OS; even though you're given the option to do so, the value does not actually set. This software is commonly used by individuals seeking to tweak the memory latencies on motherboards that do not otherwise supply the options within the BIOS or for enthusiast benchmarkers looking to tweak that last tiny amount of system efficiency.

CPU-Z: Purely a diagnostic and system display application, this software is run from within the OS and details a vast amount of easy to read and comprehend information with regards to the CPU and motherboard. The memory tab allows for the information displayed to be read from any single module of memory installed in the system. This allows for the system to have multiple modules in multiple slots and for information such as the frequency, primary latencies, a small amount of secondary timings (often one to three readings) and the command rate at which the memory operates. Additionally the application can read information stored on the module, such as manufacturer, manufacturing date, manufacturing batch and the amount of memory available on the DIMM. To round it out, the memory tab of CPU-Z can also display the SPD frequencies and timings as well as any other automated profile as such EPP and XMP.

Everest: A full diagnostic suite is built into this application. It runs within the OS and lets the user read information from many areas of the system as well as allowing for testing between different sub-systems such as the memory read, write and latency. We use this a lot in Atomic testing. As such, this application serves a dual purpose in that it can read information about the memory, both in regards to system set values or SPD readable values, and can also test areas of the memory sub-system such as read and write bandwidth.

Stress Prime 2004 Orthos: A stress testing program commonly used to test overall system stability and a favourite among enthusiasts. This application is also run in the OS and is generally known for its ability to load a full system and its primary sub-systems. These loadings can also be shifted to load more heavily on a particular area, generally either CPU related or memory related. This application is often the secondary testing mechanism after having fully tested the memory outside of the OS using Memtest86+. Depending on the level at which you wish to test, the general load testing period for this application is to let it to run for 12 to 24 hours; however some individuals believe eight hours to be sufficient.

Prices go south

As the industry makes the inevitable change from DDR2 to DDR3 the memory economy is doing what would be expected – dumping DDR2 stock piles. As much as DDR3 has come down in price considerably since its conception and initial release, it still fails to come even close to the now excessively cheap prices of DDR2.

DDR3 is faster, offers higher bandwidth, has greater future-proofed potential and is a standard that can expand to much larger capacities to feed the ever growing need for additional memory demanded by today's computing industry – particularly gaming and other enthusiast activities. Yet, none of these positive attributes of DDR3 can out weigh the sheer price difference and price for performance ratio maintained by DDR2 memory in the current scene.

There will eventually be a mainstream switch from DDR2 to DDR3, as there was from DDR to DDR2 – and thankfully looking to occur much quicker – but for the time being, the DDR2 platform still has plenty of strength in it. With memory such as TEAM Xtreem Dark PC2-6400 4-4-4-12 kits based on ProMOS ICs going for as little as $100 for a 2x1GB kit and with quality Micron D9GMH based kits from the likes of Crucial's Ballistix series going for as little as $160 to $200, the definitive difference in value is too strong to ignore. At this pace it is only the most hardcore of gamers and benchmark enthusiasts who are jumping on the DDR3 bandwagon.

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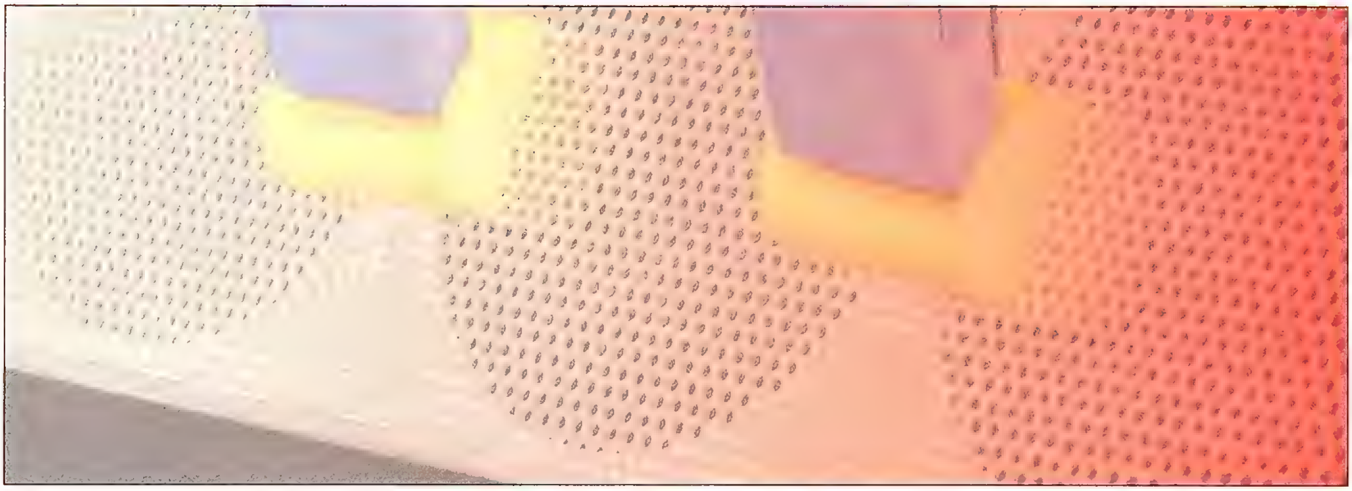


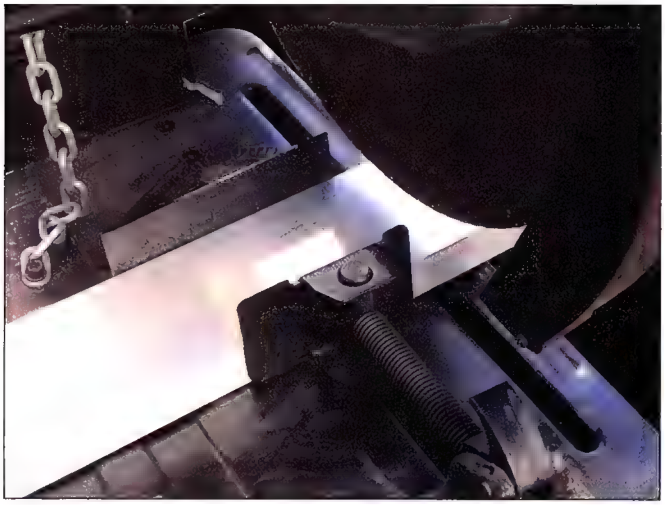
DIFFICULTY **INTERMEDIATE**

Cooling Tower Tutorial Pt 01

Ron Prouse breaks out his tools and spends some long cold nights in his shed, making us another marvel.

Someone once said, "Case modding is an art form, limited only by your own imagination – and cool ideas that you can steal from someone else." Actually, I think that was one of my own ill-thought ramblings in the modding forums, late one Saturday night. The truth with case modding is, as in any form of fabrication or manufacture, there are other issues that can bring a project to its knees before it even begins to finds its legs… skill is an obvious one, however if you have the desire that can be overcome with practise and investing in the right tools for the job. The one factor that is not so easy to overcome is a lack of suitable raw materials. Not much point in planning a mod to perfection if the key elements are things that you are unable to acquire, or afford – perpetual motion generators, enriched plutonium, plasma cutters, etc.

That said, the most precious talent of the DIY modder is adaptability – the ability to use what is available to get results that encapsulate the initial vision.



A metal cut-off saw allows for millimetre-perfect, square results when working with thick materials.

For optimal results, the hole-saw was used with a drill press, using a hydrocarbon-based cutting oil to give a smooth finish.

SUPPLIES

PC CASE GEAR
http://www.pccasegear.com, Ph 03 9584 7266
Alphacool Laing DDC pump, $139
Alphacool NexXxoS Pro II, Rev 2 Radiator, $89
RadGrillz 2 x 120 stripes aluminium grill, $25
Alphacool Coolplex Pro 10 reservoir, $55
Thermaltake Water Temperature Indicator (CL-W0033), $49.50
3/8in D-Tek Hi-Flow chrome plated brass hose fitting, $4
Swiftech 3/8" inner dimension hose, $2.50/metre
Nexus 120mm Real Silent Case Fan, $29 ea

TOOLS

The tools used in this tutorial are mainly those found in the average workshop, including a drill press and drills, finishing machine/disc sander, ½ sheet electric sander, 100mm grinder, router, Brasso metal polish, epoxy glue and a selection of hole saws. The main requirement is a decent bench or table, providing a solid, flat surface to operate on.

DISCLAIMER

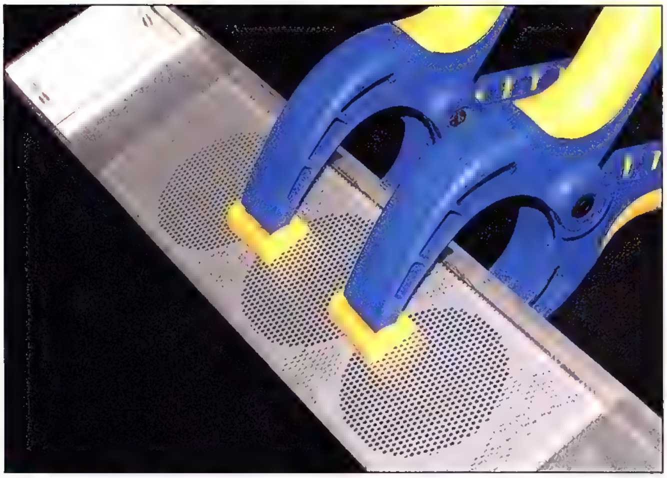
Whenever you pick up power tools, cutting and grinding instruments, or even a can of spray paint, you are putting your general wellbeing at risk from some form of industrial level accident. We take every precaution by wearing appropriate safety equipment, using tools with respect and within their limits, and by not inhaling the contents of glue and paint containers. We suggest that you should follow a similar regime, and seek professional assistance and guidance if you are attempting a task outside of your skill set.
NB. Atomic MPC and staff are not responsible for your safety or longevity.

Where is this rant actually going? Well, when I went in search of some 100mm x 25mm aluminium channel for this project, only to find that there was no such size, I did not despair. I simply called on the Gods of Inspiration, and changed my plans to suit the available materials – in this case, 80mm x 25mm channel. This meant that, while the function of the project kept its validity, the aesthetics suffered horrifically! So, what is this tutorial all about? Think of a Koolance Exos-2, a 'chassis independent' cooling solution that can be fitted to the top of a case – in this instance it will be used as a separate loop to cool two SLI graphics cards.

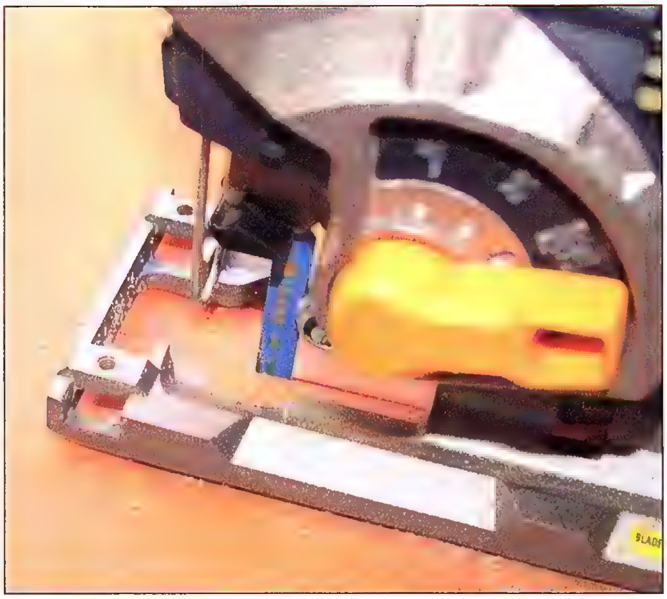
The first step was to cut the 3mm thick channel into two 400mm lengths, using a metal cut-off saw. A hacksaw would give the same outcome, but the metal saw allows for millimetre-perfect, square results in the 'thick-ish' aluminium. It was important to ensure that both of these pieces were identical, as they form the backbone of the entire construction.

The next step was to cut a series of three 62mm holes in each side, which will be the air inlets to the radiator. To get optimal results, the centres were pre-drilled with a 3mm pilot hole, and the hole-saw was used with a drill press. Unlike thinner material, the channel was thick enough for the centre-drill bit in the hole saw to run 'true', so the holes were not in danger of becoming elliptical. In thinner material, it is prudent to use a wooden block clamped to the work-piece to avoid this common pitfall. In aluminium, a hydrocarbon-based cutting oil will help to give a professional finish, and help preserve the cutting edges of the saw. Once the holes were drilled, a rotary sanding drum was used to remove any residual burrs and smooth the final finish to the point where it could be polished using Brasso and 1200-grit sandpaper.

The outside, visible areas of the channel sides were then polished to a mirror-finish using a buff-wheel attachment on a 150mm bench grinder – they will need to be polished again by hand later, but this initial treatment got rid of the worst of the scratches. Four 25 x 25mm sections of aluminium angle were cut so that they would fit inside the ends of the channel, and they will be used to secure the front and rear aluminium end-plates later. The angle sections were then riveted to the channel using countersunk 1/8in rivets.



▲ The air inlets had AC Ryan MeshX glued to the inside using five-minute epoxy adhesive.

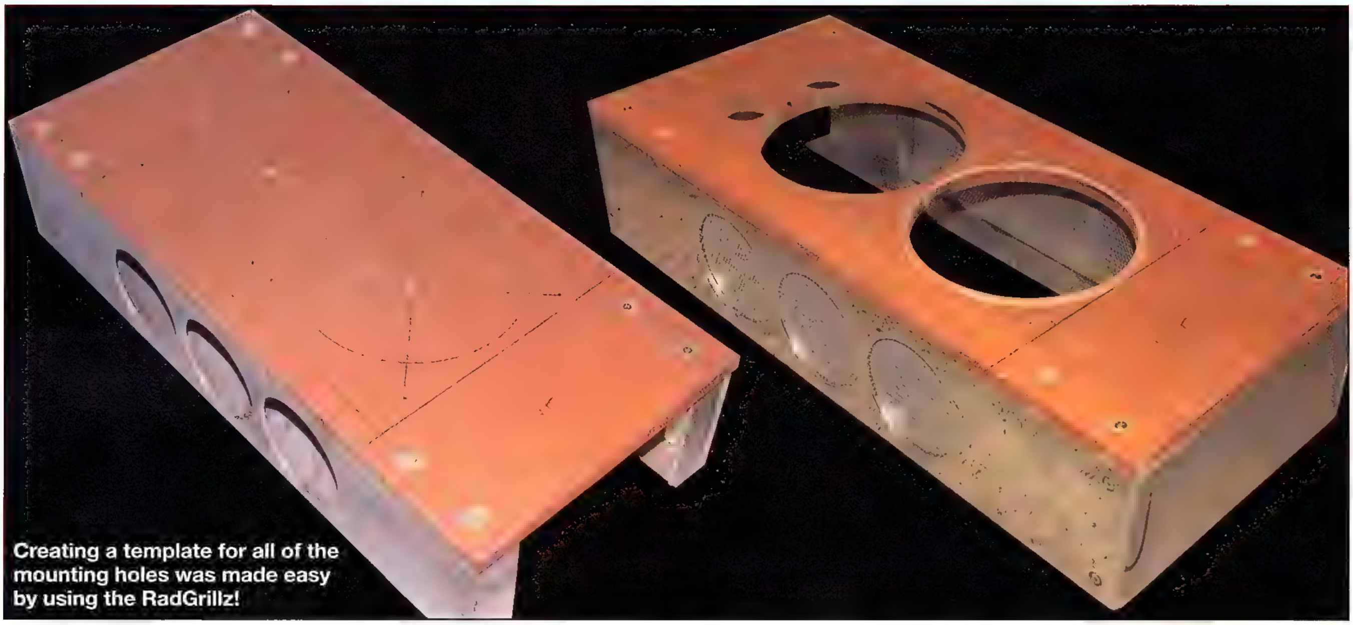


▲ Acrylic sheet is easy to machine with metal working tools and abrasives, as long as you realise just how brittle it really is!

The air inlets had sections of AC Ryan MeshX glued to the inside, using 5-minute epoxy adhesive. Firstly, the inside of the channel was thoroughly cleaned using acetone, and the mesh sections cut to size with a 100mm angle grinder and 1mm cutting blade. The epoxy glue was mixed, and then a generous amount spread around the areas that will not be visible. The mesh was then clamped down into place, making the glue squeeze up and out through the holes … just like a Vita Wheat/Vegemite sandwich! The glue then pools over the top of the mesh, trapping it securely into place.

The mounting plate, or shroud, for the 2x 120mm fans and radiator was cut out of 5mm thick acrylic sheet, mainly because it is structurally sound and easy to machine. A fine-toothed blade jigsaw was used to cut out the initial shape - leaving a millimetre 'overhang' all-round - and then a ½-sheet power sander with 120-grit aluminium oxide sandpaper was used to obtain the exact dimensions. The edges of the acrylic were kept square by placing the lower section of the sander against the side of a wooden box, and pushing the shroud against the sanding plate at 90° across the top of the box. A finer 240-grit paper was then used, and the edges eventually wet-sanded to a glass finish, again using Brasso and 1200-grit.

With the outer shroud finished, the next step was to cut out the fan/radiator and plumbing holes. Creating a template for all of the mounting holes was simple – use the RadGrillz! After all, the RadGrillz is designed



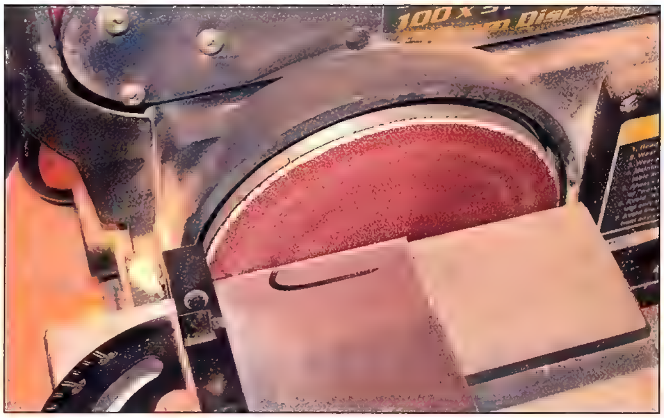
Creating a template for all of the mounting holes was made easy by using the RadGrillz!

to attach to all of the relevant holes on the radiator, so it was just a matter of locating it on the right spot and marking out the hole positions onto the paper cover-sheet on the acrylic. The holes were drilled with a 4mm bit to give some allowance for variation, and a countersink bit took all of the sharp edges off. The centres of the fan ports were found by bisecting the four fan-screw holes, and then pilot holes were drilled. A 114mm hole saw and drill press was used to cut the fan ports, and then the inside perimeters sanded and polished like we did earlier. The radiator inlet/outlet holes were marked and drilled out with a 30mm hole saw using the same method. The shroud was then fitted to the channel using countersunk 3mm holes, and two end plates were cut and shaped out of 2mm thick sheet aluminium.

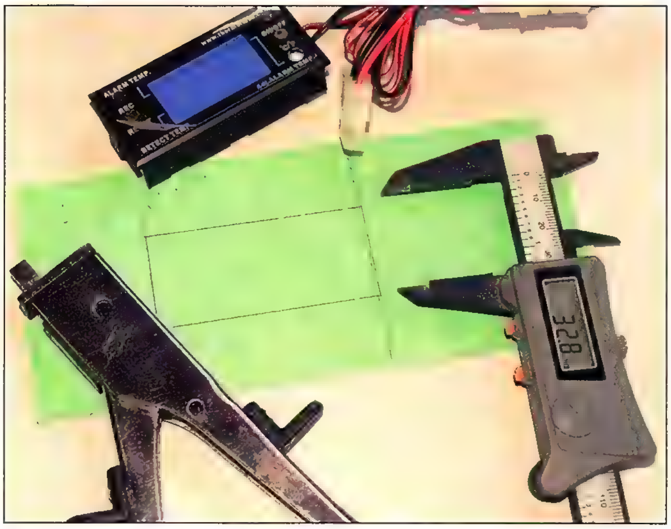
Getting a smooth finish in sheet aluminium is hard when it is cut with a jigsaw, so the best method for the DIYer is to cut it slightly oversize, and then grind it back to dimension with a disc sander – the same method works really well with acrylic, too. When the size of the shroud was originally planned, a 2mm front and rear overhang was incorporated so that the plates would sit inside the lip. This will give the front a smoother and uniform appearance to the lower structure. The plates were then drilled and attached with countersunk Allen head screws

To add some functionality – as well as the obligatory bling! – a Thermaltake water temperature indicator LCD was added to the front plate. With intricate work like this a digital Vernier calliper is an invaluable piece of equipment.

The two main things to watch are that the LCD is perfectly square with the panel, and that you don't cut the opening too large to allow the display to mount securely. Remember it is always easier to file out a little more than to start all over. The aluminium plate was covered with masking tape, to protect the surface and to give a good surface to mark-out on. A pilot hole was drilled, and then the hole cut out with a nibbler. A jewellers file can then be used to remove any burrs and round off the edges.



Getting a smooth finish in sheet aluminium is achieved by using a disc sander with a fine abrasive.

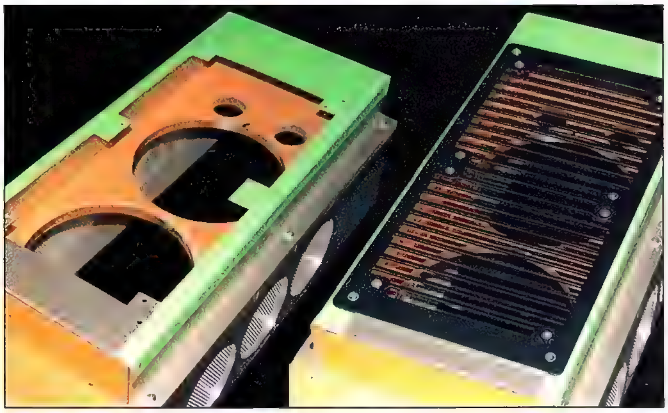


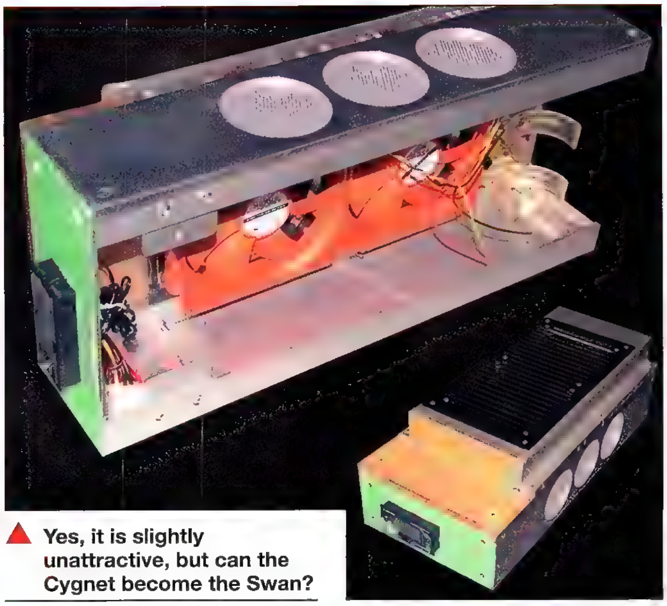
Intricate work like this requires the right tools and plenty of patience.

The top cover was folded-up out of a 1mm thick sheet of brushed aluminium – a Lian Li PC-60 side cover. This was a mistake, as the anodising marked quite badly on the edges of the folds, but it is still passable. Folding sheet metal at home is not that difficult using an old but effective method; a B&D Workmate and a couple of pieces of angle metal. Clamp the sheet metal between the lengths of angle, allowing for the thickness of the sheet in all of your calculations. For instance, 1mm thick sheet will add 1mm to the length of any external folds, conversely it will subtract 1mm to the internal dimension. Use a third piece of bar to actually perform the fold, so that the force of the bend will be spread evenly across the face of the sheet metal. The corner folds can be 'sharpened up' by gently tapping along the edge with a nylon mallet. Just do it gently!

Once the top cover was fabricated, the opening for exhausting air was cut out with a nibbler. The RadGrillz was positioned, and then the outline of the mounting points drawn onto the cover. The inner edge of the cover was cut 2mm larger than the RadGrillz, so that the lip of the cover opening will not be visible externally. Once the opening was cut and filed smooth, the RadGrillz

An old but effective method to fold sheet metal; a B&D Workmate and a couple of pieces of angle metal.





Yes, it is slightly unattractive, but can the Cygnet become the Swan?

was screwed into place using 3mm x 5mm countersunk screws. The open ends of the cover had acrylic plates shaped to fit, and these will have some additional LED lighting added later.

Yes, it is slightly unattractive, but we did mention in the intro that the aesthetics had suffered horrifically! Hopefully, in Part 02, we can get it a little bit 'prettier', at least enough to make it magazine-worthy.

From the other perspective, it will be filled with some quality cooling components, and everything is on target for the self-contained cooling loop to fit into an area only 115mm high. Part 02 will include the plumbing, wiring and commissioning of the components, and there may be space to include a 5-7-12V switch to better control the fan speeds.

Multimedia, multi talented!

Studying IT at Monash will ensure you're multi talented. Take Jay Boston who graduated with an IT double degree in 2006. He now runs his own business.

Since graduating, Jay has established his own boutique creative new media agency which specialises in simplistic, user-driven creative web solutions.

Describing his time at university as a challenging and rewarding education experience, Jay advises, *"If you come to Monash, get ready for an education specific to your needs, tailored to you and a rewarding journey about yourself. As one of the most recognised educational institutions in the world, you cannot go wrong with Monash!"*

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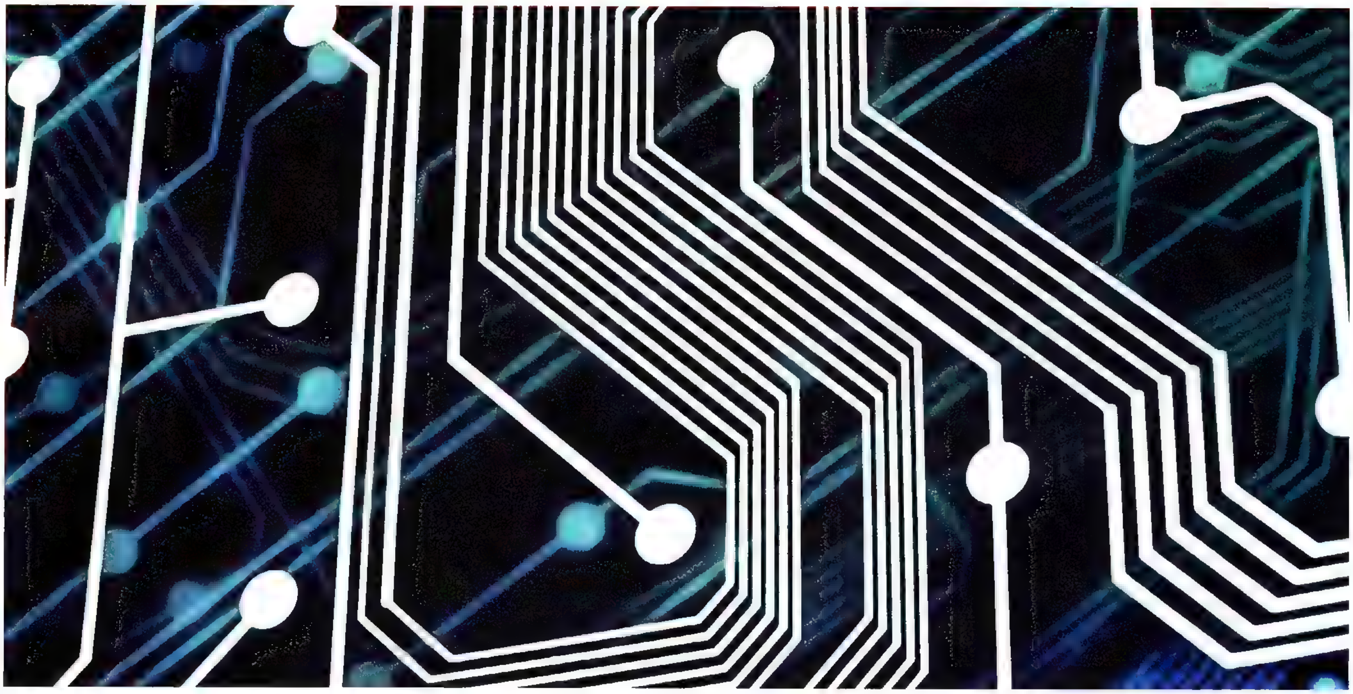


Experience and English: Getting a Job

Chris Taylor takes a look at making yourself a more employable person.

Over the past few months, this here section – your atomic-powered source of all things education and employment-related – has explored issues relevant, mostly, to the reader who's just beginning or about to begin their tertiary education. This month, though, were going to skip ahead two or three or maybe four years; or more, even (if you're planning on becoming a lifelong learner, a professional student) to the part where you, the diploma- or degree-equipped Atomican, set off in search of a job so you can afford the weather-board house with the white picket fence, a spouse who bakes apple pies, two point five kids and small dog that, if all goes to plan, will be christened Spot. Or Rover.

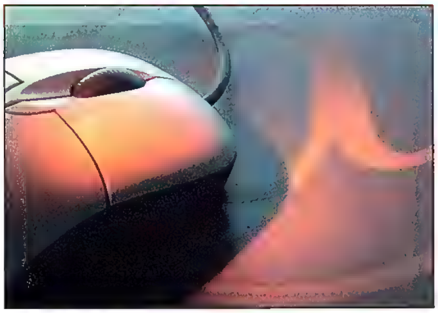
Finding an appropriate job ad

Before we get into how you, dear fresh-graduate-of-university, go about getting the experience so many employers request, let us make this point; you must be realistic in what you hope to achieve when you finish your studies. Look to entry-level positions. These, by definition, shouldn't require too much in the way of experience. Many a higher up in the IT industry has started off manning – or womaning, as the case may be – a support desk or testing software. 'Tis the nature of the game, folks. And, while we've got a captive audience, we ought make a second important point. You'll see many a job ad that requests a degree, knowledge of this or that and a stupid amount of experience. Don't assume you need all of that to get the job. The employer is merely stating their ideal. Rare is the employer who honestly believes they'll find someone with all that to their name.

The thousand-yard stare

Employers in the IT industry, much like their counterparts in other fields, place great emphasis on experience. Sure, you've just walked out of UNSW or Monash with a neat little document – the ink still damp – that says you're pretty flash with networks. But here's a wee slice of reality – someone can have a degree but still not have even half a damn clue about anything. A good many people are completely and utterly and depressingly incapable of taking the theories they've garnered from three years of lectures and readings and applying them in the real world. In short, having professional experience – something that tells employers that yeah, you're capable of coping in a situation where the problems are actually tangible – is as important as any piece of paper. And therein lies the young job seeker's dilemma. Just how the hell are you meant to get experience if no one's willing to hire you due to your lack of experience? Your university should be able to help you. A good many degrees complete with anywhere between three and six months' worth of industry placement. Too, beyond the experience, these internships prove quite the foot in the door when it comes

> “Employers in the IT industry, much like counterparts in other fields, place great emphasis on experience.”



to going for a proper job once you've completed your degree. Furthermore, universities run IT help desks of their own. See if you can get a job at one of them while you study. Working part-time in IT support or a similar position while you're studying – shit kicking as such a job may be – will place you firmly at the head of the pack when you start to look for full-time employment. And there's always the option of working unpaid for a few months. Obviously, this option isn't practical for all – you still need a way of paying for your net connection and breakfast cereal and beer – but it's worked for many people in the past. Too, some government departments offer cadetships that last anywhere between six and twelve months. These are a great way of building up your resume.

Speak the English

As well as being in possession of a qualification or two and a bit of experience, you must be able to communicate. Note the distinct lack of ideally or should or preferably in that sentence. Any job you get in IT will require more of you than just coding, assembling or installing. You're going to be required to talk to people, write emails, operate a telephone and produce documentation that can actually be understood by someone who is not you. If you're a particularly cunning wordsmith or competent public speaker, be sure to mention as much on your resume. Don't for a moment think we're overstating the importance of communication skills here. As forum whore brains pointed out to this writer, almost every applicant for a given position in the IT industry will be more than capable of performing all the technical aspects of the job. Rarer, though, is the applicant who can handle all that stuff and communicate effectively with their co-workers, supervisors and clients. Also, choose your words carefully in your resume and – assuming you get that far – interview. Do not present like an arrogant arsehole. If you come across as a prat, there's no way any employer's going to trust you to deal with their valued clients. Meaning you're not going to get the job.

Think outside the square

Remember, you're not necessarily going to be working for an IT company. Probably, you'll just be in the IT department of a business working in some other field – mining or retail or publishing, for instance. It pays to keep in mind that, when going for a job in one of these fields, you'll be looked upon highly if you are knowledgeable not only about the organisation you're seeking to join, but the industry itself as well. Depending on where you're looking, this may mean another qualification, a bit of experience or perhaps just a demonstrated knowledge or interest in the area.

Time to get back out on them corners

A few years ago, many a naysayer was saying nay about the IT industry, making out like it was damn near impossible for anyone – let alone some kid fresh out of UQ – to get a job in it. Times have, thankfully, changed. For the moment, at least, it's an employees' market. So long as you're realistic in what you apply for, are capable of communicating and can figure out a way to get a bit of experience under your belt, you should be able to pick up something.

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I/O

Daniel Rutter's getting himself all hot under the collar dealing with reader problems.

I/O OF THE MONTH

Unswappable

I I was wondering how important page files are these days when more and more RAM is available. If a Vista system is utilising 4GB of system RAM would the page file be redundant?

Also, if we are required to have a page file, how big should it be, and is it best placed on the OS partition, a separate HDD or a USB high-speed Flash drive, as I believe Vista has the ability to do?

Ian Howard

O The page file does still have a purpose, even in a computer that has enough RAM that it doesn't have to thrash the page file all the time to make up for lacking physical memory.

It's surprising how much data a modern operating system with a few applications running can be juggling at any given time. Applications may automatically reserve a huge slab of memory for themselves when you run them, and never actually use very much of it. If you've got a page file, this isn't a problem; the memory the program's actually using is mapped to physical RAM, and the memory that it asks for just in case but seldom actually does anything with gets paged out to disk.

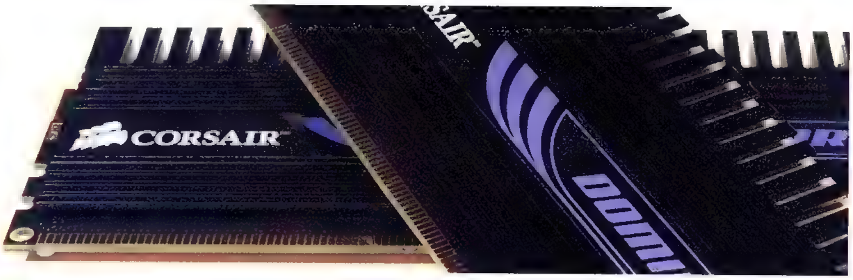
Usually, this works very well. It'll only create an obvious performance hit in perverse cases. If, for instance, an application writes data to 250Mb of RAM, then does nothing with it for hours on end, that data will be paged out to disk so that other apps can use the physical RAM. If the app then suddenly wants all of that data again, you'll find yourself waiting for disk access. This sort of thing does not happen very often.

If you don't have a swap file, then all of the memory that every application and operating system process ever allocates has to have its own place in the physical RAM, which means you can run out of that physical RAM – and start getting hard memory errors – surprisingly quickly. Modern operating systems are smart enough about their virtual memory management that there's no real performance advantage to disabling the swap file, if it's even possible to do so.

(Vista, by the way, is famous for never having very much RAM free, but that's because it uses as much RAM as it can for caching whenever that RAM isn't needed for anything else. This, in itself, doesn't have much to do with the page file.)

If you've got enough RAM that you can run all the programs you want without swap file flogging, then the location of the swap file really doesn't matter very much, and you also might as well leave it on the default automatically-adjusted-size setting. Optimally, swap should be on an internal hard drive that isn't used by whatever software uses the most memory, but it really isn't a big deal.

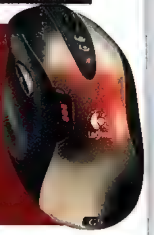
Note that Windows won't let you put swap files on any 'removable' device, including USB drives. This is sensible, because Bad Things will happen if you unplug a swap disk. Vista's USB-drive caching system, ReadyBoost, is unassociated with the swap file, and also famous for not actually making much difference to anything if you've got a reasonable amount of physical RAM.



Even in these heady days of 4GB systems, the humble page file is still useful.

I/O OTM wins a Logitech G5!

There's a mouse in the house. Okay, it's not in the house, it's in IO. And it looks damn good.



Also, the space bar had melted

I I was curious one night when I was on my laptop and noticed how much heat was coming out the exhaust vent. I downloaded a CPU temperature monitor. The CPU was running at 71°, which I thought was a little hot. All I was doing was defragmenting the hard drive.

Is that a little hot for an Intel Core 2 Duo T5300 in a laptop?

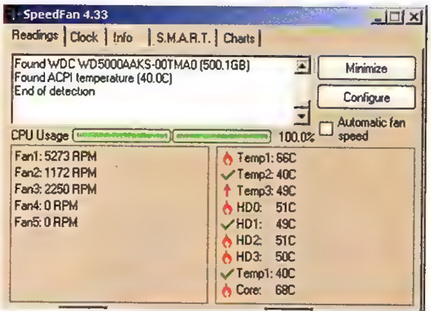
Dylan

O Yes, 71° is definitely rather warm. The official ceiling temperature for your Merom-2M CPU is 85°C, though, so you should have a fair bit of headroom before any crashes start happening.

There are more factors here than you might at first think, though.

First: The CPU temperature is reported by motherboard hardware that reads a thermal diode near (not actually in) the CPU core, and may not be reading it correctly. It's also barely possible that the monitoring software you're using is mis-displaying the temperature.

I don't actually think this is the case, but you certainly shouldn't assume that there's some sort of



```
Found WDC WD5000AAKS-00TMA0 (500.1GB)
Found ACPI temperature (40.0C)
End of detection
```

CPU Usage 100.0%

☐ Automatic fan speed

```
Fan1: 5273 RPM      Temp1: 66C
Fan2: 1172 RPM      Temp2: 40C
Fan3: 2250 RPM      Temp3: 49C
Fan4: 0 RPM         HD0:   51C
Fan5: 0 RPM         HD1:   49C
                    HD2:   51C
                    HD3:   50C
                    Temp1: 40C
                    Core:  68C
```

Some of us are rather used to those little flame icons.

NASA-specification super-thermometer in there. The actual core temperature could easily be 65°, or 75° for that matter.

Second: In desktop PCs with reasonable cooling air flow, the temperature of the computer's components is relatively independent. In a laptop, though, the toasty warm hard drive (heated up by air friction on the platters whenever it spins) can heat up the rest of the computer even if the CPU, RAM and graphics hardware have little to do.

Third: All current PC CPUs, laptop and desktop, have pretty advanced power saving features. Those features can automatically greatly reduce the processor's power consumption when it's doing anything.

If you've got a Windows PC's Power Scheme set to 'Always On', though (or 'Home/Office Desktop', and the computer's running from mains power), then the power saving features will never kick in. For more info about the SpeedStep system built into your CPU, see http://www.bay-wolf.com/speedstep.htm.

Fourth: The simplest explanation for the high temperature is that the little cooling vents in your laptop are clogged with dust. This is pretty normal, but may require you to pull the whole computer apart to clean the dust out.

If you notice a laptop's cooling fans are all running at maximum power when they almost never used to, dust is very likely to be the culprit.

Overheating II: The Saga Continues

I seem to be experiencing the same kind of problems as in the "Never rule out goblins" letter from ten issues ago. It's summer now in South Africa and a few degrees hotter, and my PC restarted yesterday without any warning while I was playing DiRT.

The whole PC is less than eight months old and still very new (clean). I purchased an 8800 GTX a while back and had to replace two consecutive 500W power supplies (some funny brand) when they couldn't handle the load and blew up. I opted for an Antec 650W, and the system finally worked perfectly.

What worries me however, when I checked under load, my I/O controller temperature registered 91°C, which I think is way too hot and may have caused the restart. The memory controller was 85° and CPU around 55°. I didn't, however, check to see what the GTX was running at.

I've got a 2.13GHz Core 2 Duo, Intel DG33BU motherboard, 2GB DDR2 667MHz RAM, two 320GB SATA Seagate Barracuda drives, one Leadtek GeForce 8800 GTX, and WinXP SP2.

I have the Intel health monitor installed and by default, no temperatures or any voltages is in the red. The log is clean as well. Could it be my PSU or the I/O controller running at such a high temperature that caused the restart?

Neil Nordeje

Yes, it definitely does sound like a heat problem. When WinXP suddenly reboots, what probably actually happened is a bluescreen error, which by default causes XP to reboot (you can change that behaviour in System Properties > Advanced > Startup and Recovery Settings, though being able to read the bluescreen won't necessarily do you any good at all).

The temperatures you're reporting, if they're accurate – and they're probably not very inaccurate – are indeed high enough to cause a hard crash. Yes, it could easily be an overheating motherboard chip that's doing it, if there isn't much air flow over that bit of the mobo.

It's pretty likely that my usual diagnostic trick for these sorts of problems – take the side off the case and point a desk fan in there – will stop the reboots. If that is indeed the case, then just beefing up the case ventilation ought to be enough to cure the problem for good.

The lazy way of doing that is just leaving the side off the case, but many PC cases these days have one or more fan mount locations with no fan installed in them; fill all of the fan mounts and you'll probably be okay.

(Neil got back to me; it turned out that "the immense size of the GTX8800 heat sink was covering almost half of the I/O controller's heat sink". He added an old Pentium II CPU fan to the I/O controller heat sink, its temperature dropped 25 degrees, and all was well!)

Putting it to work

I have always wondered why CPU (and other) fans aren't powered by the heat from the CPU (or other chip). Considering how much energy they pump out per square centimetre, there must be some way to use it – fans don't use a lot!

I can see possibilities here, but I am not sure if there is a way to effectively harness this power in an efficient way.

Steve

If you model your CPU as just being a hundred-watt (say) heater, then yes, you could harvest quite a large slice of that hundred watts from it.

The limitation, though, is that the CPU has a ceiling temperature, 10 or 20°C below the boiling point of water. You have to keep it cooler than that temperature, or it stops working.

This creates a big problem. All heat engines work on the temperature differential between their hot side and their cool side, and a temperature differential of only about 70°C, at best, is not enough for better than miserable efficiency.

If you've got a 100 watt heater with a 90°C temperature limit, and 20° ambient air, you'll have a hard time harvesting more than a few watts from it. Realistically, one watt is likely to be the ceiling. And, of course, the apparatus needed to do that will be a lot more expensive and elaborate than a simple chunk of metal with a fan on it, so your generator won't have come anywhere close to paying for itself before it wears out.

▲ **Not shown: Eight-way game of Supreme Commander on quad core PCs with CPU heat generator attachments.**

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FALLOUT

Funnies and humour from the fallout zone

Tools of war

Logan Booker does his best to singlehandedly hold the front line.

Ascending the mountain had been a trying experience for Sergeant Edwards, but not for the reasons he'd expected.

At first, climbing the almost vertical ridge hadn't been so bad – the pair of soldiers had the proper gear, they were fresh, and the last enemy contact had been four days ago. Things had only taken a turn for the worst two hours in, when Private Doakes, who had been silent for most of the way, breathed a curse. It was dirty one too, the sort you only scrape out of the gutter when your girlfriend's dad quietly reaches for his shotgun from above the fireplace moments after you've asked for his daughter's hand in marriage.

Edward didn't bother to enquire as to what was wrong – he'd probably just grazed himself on the rock face. It was only when the breathing of swear words turned into a torrent of filth that Edwards stopped the procession.

"What's wrong Doakes?"

"Lost my gun, sir."

The young private looked up at him. A child with a chocolate-covered face could not have given him a guiltier stare.

"I beg your pardon?"

"My gun, sir. I lost it."

Edwards stifled a groan. "Okay, Private. When's the last time you saw it?"

"At the bottom of the cliff, sir."

"And where are we now?"

"A bit up the cliff, sir."

"And by a bit up the cliff, you mean..."

"Most of the way up. Sir."

Indeed, they'd almost reached the top. If Edwards squinted, he could see the fluffy mound of vegetation that marked the peak.

Obviously, a soldier misplacing his gun was never a good thing, but usually it was easy to source a replacement, even if it was just a pistol. In the case of Doakes, however, it was a calamity.

"Do you know why we're climbing this mountain, Doakes?"

"To take out the Red Star Alliance's primary vehicle yard in this region, sir, using an EMP missile."

"And who was carrying that missile, Doakes?"

"I'm pretty sure it was me, sir."

"And are you carrying it now?"

"No, sir. It's probably sitting by the bushes where I took a wee before we started climbing. Sir."

Edwards almost laughed. It was very possible that Doakes' bladder would cost them tomorrow's battle. Doakes looked agitated.

"You need to wee again, don't you?'

"Yes sir."

"Well, you'll just have to hold it until we get to the bottom."

Five hours later, Edwards and Doakes reached the top of the mountain, missile in hand. It would take them just moments to deploy the stabilising tripod, aim the explosive payload and pull the trigger.

Edwards surveyed the vehicle yard. "Perfect. It looks like the entire 2nd Tank Battalion is refuelling. They won't have a single bit of armour for tomorrow!"

All the private could do in reply was cough. "Sir?"

"Yes Doakes?"

"If I was to say that I forgot the actual missile, would you be upset?"

"Only if I was to shoot you afterwards and you were still alive."

NEXT MONTH

GOT GAME?

We take a look at the wide world of amateur game design, and show you how to design and distribute your gem to the masses.

KEEPING IT COOL

It's not a glamourous peice of kit, but the humble cooling fan is still damn important - we put a range to the test to find you the best!

THE AU TEAM

An inspirational look at the aussie gang that's breaking world records with their top-notch overclocking skills.

IN THE DARK

Logan Booker sheds some light on Dark Sector with some hands on attitude and an interview with its devs.

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